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IN THE
Supreme Court of the United States

OCTOBER TERM, 1940

No. 688

DETROLA RADIO & TELEVISION
CORPORATION,

Petitioner,

vs.

HAZELTINE CORPORATION,

Respondent.

BRIEF FOR RESPONDENT

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Opinions Below.

Hazeltine Corporation v. Detrola Radio & Television Corp.:

District Court, E. D. Mich. (unreported), Findings of Fact & Conclusions of Law (Lederle, D. J.) printed in Volume II of the Record at pages 838-61.

C. C. A. 6 Opinion (Allen, C. J.), printed in Volume III of the Record at pages 1470-80, and reported at 117 F. (2d) 238.

Hazeltine Corporation v. Abrams, et al.:

District Court, E. D., N. Y. (Galston, D. J.), 7 F. Supp. 908.

C. C. A. 2 (L. Hand, C. J.), 79 F. (2d) 329.

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IN THE
Supreme Court of the United States
OCTOBER TERM, 1940

No. 666

DETROLA RADIO & TELEVISION CORPORATION,
Petitioner,

vs.

HAZELTINE CORPORATION,
Respondent.

BRIEF FOR RESPONDENT
Jurisdiction.

The date of the decree in the instant case is December 9, 1940 (III, 1470). The writ of certiorari was granted on February 3, 1941.

The jurisdiction of this Court was invoked by petitioner under Jud. Code, Sec. 240, as amended; U. S. C., Title 28, Sec. 347. The cases cited by the petitioner as sustaining the jurisdiction are *General Electric Co. v. Wabash Appliance Corp.*, 304 U. S. 364 and *Toledo Pressed Steel Co. v. Standard Parts, Inc.*, 307 U. S. 350, each of which involved a conflict as to the validity of a patent.

The questions discussed in petitioner's brief on the merits are:

(1) Whether respondent's relasue patent was improvidently granted;

(2) Whether the system of automatic volume control in radio broadcast receivers patented in respondent's relasue patent is a new and patentable invention or discovery;

(3) Whether petitioner's accused radio receivers infringe;

(4) Whether petitioner has intervening rights.

There is no conflict of lower courts on any of these questions. That will appear upon consideration of the facts, which are stated below. If the writ of certiorari herein was issued because of any supposed conflict—and such conflict was alleged in the petition for the writ—this Court may, upon consideration of those facts, decide to dismiss the writ, as it is accustomed to do “whenever in the progress of the cause facts develop which if disclosed on the application would have induced a refusal”.¹

There is no conflict on the question whether the system of automatic volume control patented in the reissue patent is a patentable invention or discovery (the second item above stated). The restricted claims of the reissue patent were approved by the Patent Office and upheld by the trial court in the case at bar, and the decision of the trial court was affirmed by the Sixth Circuit Court of Appeals. The Second Circuit Court of Appeals had held the broad claims of the original patent invalid for lack of invention, but that holding was directed to subject-matter quite different from the subject-matter of the restricted claims of the reissue patent (*post*, pp. 8-15). This Court has frequently stated that it will not grant writs to review questions of anticipation and invention where there is no conflict between decisions of circuit courts of appeals.²

¹ *Furness v. Yang-Tsee*, 242 U. S. 430, 431; *U. S. v. Rimer*, 220 U. S. 547; *Tyrrell v. Dist. of Columbia*, 243 U. S. 1, 6; *Houston Oil v. Goodrich*, 245 U. S. 440; *Layne v. Western Well Works*, 261 U. S. 387, 392; *Southern Power v. N. Carolina Pub. Serv.*, 263 U. S. 508 and *Keller v. Adams-Campbell*, 264 U. S. 314.

² *General Talking Pictures Corp. v. Western Electric Co. et al.*, 304 U. S. 175, 178-9 and cases cited.

On the question of infringement (the third item above stated), the trial court and the Court of Appeals in the case at bar were likewise in agreement, and of course there was no conflict with the Second Circuit Court of Appeals, where no question of infringement of the original patent claims was adjudicated since those claims were held invalid.

The question of acquiescence and estoppel (the fourth item above stated) is a question of fact as to which the trial court and the Court of Appeals agreed in the case at bar, and which was not presented in the Second Circuit litigation. In the *General Talking Pictures* case this Court said that granting of the writ would not be warranted merely to review evidence of acquiescence or inferences drawn from such evidence, particularly where the decision on that point rests on concurrent findings.¹

The question of the propriety of a reissue after claims of the original patent have been adjudicated to be invalid for lack of invention (the first item above stated) is one upon which this Court has never directly passed. It may be that the writ was issued for that reason. There is, however, no conflict among the lower courts on that subject. The conclusion reached by the Sixth Circuit Court of Appeals sustaining the reissue is in accord with a long line of cases in the lower courts, whose decisions on the question have been harmonious and without conflict (*post*, pp. 17-28).

Petitioner's Imperfect Statement of the Case.

Certain corrections need to be made in petitioner's Statement of the Case (petitioner's brief, pp. 2-4):

- (1) It is not true that "the sole business" of respondent Hazeltine Corporation is "to acquire and own patent

¹ *General Talking Pictures Corp. v. Western Electric Co.*, 304 U. S. 175, 178 and cases cited.

rights under which it grants licenses." On the contrary, Hazeltine Corporation "was organized early in 1924 and since that time has been engaged exclusively in designing and developing radio and television apparatus and conducting research in connection therewith and patenting inventions resulting therefrom and in rendering engineering services exclusively (with but few exceptions) to its licensees under its patents. This includes designing and testing apparatus for the licensed manufacturers and helping them in their manufacturing problems. For this purpose it maintains three research laboratories at an approximate cost of \$100,000 per year, employing a number of radio engineers" (Agreed Finding 10, II, 842-3). For these research, development and engineering services and its patent rights the sole compensation paid to Hazeltine by its licensees is the license royalty. The royalty rate is that fixed in the supersedeas order herein (II, 862) "one and one-half percent ($1\frac{1}{2}\%$) of the aggregate net sales price", and "all of the substantial manufacturers of radio receiving apparatus in the United States, except the Defendant, are now using the Wheeler system under license" (Finding 18, II, 853).

(2) It is not true that in the *Abrams* case the Second Circuit Court of Appeals "held the patent to be invalid for failure to disclose a patentable invention" (petitioner's brief, p. 2). In that case the court held claims 1, 5, 6 and 10 of the original patent invalid because the broad subject matter defined by those claims did not represent any invention over what was previously known. The new combination of electrical elements defined in the restricted claims of the reissue patent, and which is the subject matter of the instant litigation, was not involved in that litigation, and its patentability was not there adjudicated (see post, pp. 8-15).

(3) The implication in paragraph 3 of petitioner's Statement of the Case (brief, p. 3) that the Patent Office in granting the reissue was unaware of and did not take into account the adverse decisions on the original patent in the Second Circuit is erroneous. During the prosecution of the reissue application the Patent Office was fully informed of the litigation in the Second Circuit, and had copies of Judge Galston's opinion and of the opinion of the Court of Appeals in the *Abrams* case (Agreed Finding 9, II, 842).

Summary Statement of the Facts.

In the last half of the year 1925 the patentee, Harold A. Wheeler, a young man of twenty-two, was a post-graduate student of physics at Johns Hopkins University and a part-time employee of respondent Hazeltine Corporation engaged in development and research work in the Hazeltine laboratory. He was particularly aware of the defect in radio broadcast receivers known as "blasting", a defect evidenced by uncontrolled upward surges of amplification resulting in blasts of distorted sound. In the early summer of 1925 he set to work to devise a remedy for that defect. The course of his investigations and proposals is set down, step by step, in his laboratory notebook, whose entries constitute a revealing record of inventive ingenuity devising, investigating and rejecting or amending a series of schemes, until he finally arrived in December 1925 at his preferred system which is the subject matter of this litigation.¹

It was well known that the amplifying effect of the vacuum tube amplifiers (triodes) used in radio broadcast receiving sets could be controlled by a negative electrical potential (biasing voltage) applied to the third electrode or

¹ This record is reviewed in more detail, with reference to the relevant record pages, at a later place in this brief (post, pp. 58-63).

grid of the tube. Wheeler's problem was to get a control potential strong enough and always proportional to the amplified signal in the receiving set, so that application of this potential to the grids of the amplifying triodes would give to the broadcast receiver self-control of its own sound volume. He first thought of getting the required control potential from the finally amplified signal energy at the loud speaker; but this energy though ample in amount, was of audible frequency (i.e. it had been "detected")¹ and consequently a control potential derived from it would mar the musical contrasts which should be faithfully preserved. Wheeler then turned for his source of control potential to the radio-frequency signal energy at a point in the set where it had not yet been "detected." Here the energy was appropriate to his purpose except that it was too feeble—a fraction of one volt, whereas he had found that he needed a control potential of the order of ten volts. After a number of false starts in the direction of supplementary amplifying apparatus of complicated character, he hit upon the idea of adding another step of radio-frequency amplification within the receiving set, to amplify the signal voltage thereof to a higher level, of the order of ten volts. This was on December 10, 1925. Once possessed of this idea, his problem became—how best to derive his control potential from this more highly amplified signal energy.

His first idea was to get his control potential from a supplementary source of energy, a so-called B battery, associated with a triode rectifier-amplifier, using the potential of the highly amplified signal energy to control the

¹ A concise and adequate statement of radio broadcast reception and detection is included in the opinion of the Sixth Circuit Court of Appeals (III, 1477, and see also *post*, pp. 41-46).

energy released from the B battery by applying that potential as a biasing potential to the grid of the rectifier-amplifier. He foresaw that this indirect method of getting his control potential would call for critical balancing by the user of a so-called C battery voltage against the voltage of the B battery, and he provided a separate adjustment, called a potentiometer, for that purpose. He went ahead with the construction of a receiver with this triode automatic volume control, and completed it during the Christmas holidays.

But at Johns Hopkins before the holidays he carried further his research work to its final step—his diode system of automatic volume control. On December 17, 1925 at Johns Hopkins he entered in his notebook a full disclosure of this system, using a diode united with a high external resistance opposed to the relatively low internal resistance of the diode, to derive the desired control potential *directly* from the signal itself by linear rectification without the interposition of any extraneous source of supplemental energy.

At his home in Washington during the Christmas holidays Wheeler completed and tried out the receiver with the triode rectifier and associated B and C batteries. This turned out to be very critical and, with the type of apparatus and the limited amount of testing equipment he had at his home, he found it impossible to get satisfactory operation in the time then available to him. He then substituted for the triode rectifier with its associated batteries the diode rectifier united with a high external resistance which he had devised and recorded in his notebook on December 17th. After this change the operation of the automatic volume control system was immediately successful, and he demonstrated it to a number of his friends on January 3, 1926. Later on he disclosed it to the Hazeltine Corporation

engineers and went forward with his application for patent and with the commercialization of his invention (see *post*, pp. 63-68).

The application for the original patent was filed on July 7, 1927. In it Wheeler disclosed both these types of automatic volume control (1) a system in which the control potential was created by using the highly amplified signal energy to control the supplemental energy of a B battery through a triode rectifier-amplifier arrangement and (2) a system in which the control potential was derived directly from the highly amplified signal energy by means of a diode united with a high external resistance to give linear rectification. Believing that his automatic volume control system, whether with the triode or with the diode arrangement, contained broad aspects of patentable novelty, Wheeler presented in his original patent broad claims which would embrace both arrangements. That is to say, the scope of the claims was indifferent to the particular way in which the control potential was derived from the highly amplified signal energy. The triode arrangement was illustrated in Figures 4, 5 and 6 of the original patent and the arrangement including a diode united with a high resistance was illustrated in Figures 1, 3 and 7. The arrangement using the diode united with a high resistance was set forth as the preferred embodiment, and its peculiar advantages were fully stated (III, 1074A ln. 29-109 incl. off'd. I, 19).

The original patent 1,879,863 issued on September 27, 1932. On August 6, 1934, Judge Galston in the Eastern District of New York¹ found claims 1, 5, 6 and 10 void for want of invention. Claims 1 and 10 of the original patent

¹ *Haseltine Corporation v. Abrams, et al.*, 7 F. Supp. 908.

are printed in the margin.¹ Judge Galston based his judgment on the patent to Affel, 1,574,780 granted March 2, 1926, the patent to Bjornson, 1,666,676 granted April 17, 1928 and the patent to Heising, 1,687,245 granted October 9, 1928 (see 7 F. Supp. 914).

The patentability of Wheeler's system of automatic volume control using a diode united with a high resistance, which is the subject matter of the present litigation, was not adjudicated in the *Abrams* case. Claims 1, 5 and 6 of the original patent were so broadly phrased as to embrace both the triode system and the diode system disclosed in the original patent specification. Claim 10 of the original patent, although it called for a diode rectifier, did not define a system in which the diode was united with a high resistance, and in this it differed from claim 1 of the reissue patent. As the Sixth Circuit Court of Appeals said (Opin-

¹ Claims 1 and 10 of the original Wheeler patent (III, 1074A-1075) adjudicated in the Second Circuit:

"1. In a signaling system a vacuum tube amplifier having a cathode and a control electrode, a vacuum tube detector coupled to said amplifier, said detector having an output electrode, means for maintaining said output electrode normally negative relative to at least part of said amplifier cathode, means for causing said output electrode to become more negative in the presence of an amplified signal, and a direct-current connection between said control electrode and said output electrode, whereby the amplification of said amplifier is regulated automatically."

"10. In a signaling system, a vacuum tube amplifier having a cathode and a control electrode, a diode detector coupled to said amplifier, said detector having an anode, means for maintaining said anode normally negative relative to at least part of said amplifier cathode, means for causing said anode to become more negative in the presence of an amplified signal, and a direct-current connection between said control electrode and said anode, whereby the amplification of said amplifier is regulated automatically."

ion, III, 1476) "... claim 1 of the reissue patent is not in substance the same as claim 10 of the original patent. In addition to what was formerly described, claim 1 adds the essential element of the 'high resistance connected between the rectifier anode and the amplifier cathode'".

The patents to Heising and Bjornson, to which Judge Galston made reference in his opinion, had not issued when Wheeler filed his original patent application on July 7, 1927, and though the Affel patent had issued at that time it had not issued in December 1925 when Wheeler made his invention and it was not known to him when he filed his application. These patents were not called to Wheeler's attention by the Patent Office during the prosecution of his application for the original patent, and he was not aware of them until about the time of the filing of the answer in the *Abrams* case, about May 1934 (Agreed Finding 8, II, 842). The original specification, drawn without knowledge of the work of these prior inventors, was not particularly apt to distinguish Wheeler's invention from that earlier work in the field of automatic volume control. But at the trial of the *Abrams* case respondent pressed upon the attention of the court three things which, as respondent contended, differentiated the automatic volume control systems defined by these broader original claims from the earlier work that had been disclosed in the patents of Affel, Bjornson and Heising. These three things were: (1) the application of automatic volume control by negative grid biasing voltage to a receiver as distinguished from a transmitter; (2) the derivation of the control potential from the signal energy after amplification rather than before amplification—referred to as a distinction between "regressive" and "progressive" control, and (3) a time-delay provision in the direct-current connection from the rectifier to the con-

trolled amplifier. Judge Galston was impressed by these differentiations but put them aside on the ground that they were not expressed in the claims and could not be read into them by reference to the specification. He spoke of the "many differences attempted to be drawn" by plaintiff's expert Langley between the prior work of Affel, Bjornson and Heising and the automatic volume control systems disclosed in the original patent and broadly defined in the original claims then in suit and said "It may well be that if the Wheeler claims in issue were narrowed to the improvements defined in his specification, weight could be attached to the Langley comparison. That, of course, is not permissible since it would mean a rewriting of the claims" (7 F. Supp. 913) and, at another place "Langley's differentiation is extremely interesting and doubtless sound, but the claims of the patent are silent on the subject" (914).

The decree dismissing the bill in the *Abrams* case was entered on September 18, 1934. Respondent at that time was advised that two courses were open to it under the reissue statute.¹ One course, indicated by the very words in Judge Galston's opinion, was to add to the patent, by reissue, claims restricted to subject-matter included as part of the original disclosure and lying clearly beyond any work of prior inventors. An additional course simultaneously open to respondent was to test by appeal its contention that it had a right to a broader monopoly defined by the original claims, when interpreted as they should be in the light of the specification. On the advice of counsel respondent followed both of these courses. On September 21, 1934, three days after the entry of the decree on Judge

¹ R. S. Sec. 4916, U. S. C. Title 35, Sec. 64. Appendix, p. 80. And see *Triplett v. Lowell*, 297 U. S. 638; *Maytag Cases*, 307 U. S. 243.

Galston's opinion, respondent filed an appeal; five days later, on September 26th, it filed an application for reissue correcting the original specification in certain particulars and adding claims in a form which would more certainly differentiate Wheeler's system from prior knowledge (Agreed Findings 2 and 3, II, 839 and File Wrapper, III, 1024-9, off'd. I, 19). The claims in litigation (claims 1, 5, 6 and 10)¹ were, of course, retained in the reissue application pending the outcome of the appeal.

On July 29, 1935 the Second Circuit Court of Appeals affirmed Judge Galston's decision that original claims 1, 5, 6 and 10 were invalid for lack of invention. In an opinion by Judge Learned Hand (79 F. (2d) 329) that court expressed its reluctance to accept Judge Galston's literal inflexibility with respect to the claims; it was prepared to read the claims as limited to a receiver and as defining the derivation of the control potential from the signal energy after amplification rather than before amplification (79 F. (2d) 329-30). So interpreting the claims, the court held the particular differentiations insisted upon—i. e. (1) the application of automatic volume control to a receiver as distinguished from a transmitter; (2) the derivation of a control potential from the signal energy after amplification rather than before amplification, and (3) the time-delay provision—to be available without invention (pp. 331-2). In connection with the use of the diode, which was included broadly (i. e. without the high resistance) in Wheeler's original claim 10, Judge Hand referred to Heising's use of a diode

¹ With the reissue application there was filed a copy of the original patent on which the changes in the specification and claims made by the reissue application were indicated (III, 1034-49). All of the original claims were retained except claim 9, original claim 10 was renumbered 9, and restricted claims 12-17 inclusive were added. The added claims are found at III, 1024-9.

in a transmission system and said (p. 330) "As it stood it could not have been successfully used for Wheeler's purposes" and (p. 331) "Again as to Wheeler's triode used as a diode, it was an old device; Heising had used a diode in a not dissimilar setting . . . When, as in a receiving set, compactness becomes an end, why not eliminate the 'B' battery necessary to a triode". The decision was, that there would be no invention in the mere use of the diode as opposed to the triode.

That decision did not go at all to the question of invention involved in the instant case. As the Sixth Circuit Court of Appeals pointed out (Opinion, III, 1478-9), the Wheeler diode system defined in the claims of the reissue "does not merely embody the diode. It discloses the use of the diode united with a high external resistance opposed to the relatively low internal resistance of the diode, with a consequent linear response which results in better automatic volume control than had ever before been secured". In the Second Circuit decision the diode united with the high external resistance was not considered or discussed. Linear rectification is not mentioned. These things were not defined in the claims there litigated, and their patentability was not there adjudicated.

Petitioner's counsel in their brief (p. 14) quote extracts from the opinion of the Second Circuit Court of Appeals in which Judge Hand speaks of the "principle and means" and the "basic means" used by Wheeler, and of the "change" effected by Wheeler in what had gone before, and characterizes "this patent" as "one of those step-by-step advances" which do not constitute invention. But when these expressions are read in their context it will be seen at once that Judge Hand was talking about a system of automatic volume control by grid bias broadly considered, which was applied to a receiver as distinguished from

a transmitter and derived the control potential from the signal energy after amplification rather than before amplification. He was not speaking of the system including a diode united with a high resistance, adjudicated in the case at bar.

Having failed to maintain in the Second Circuit Court of Appeals the validity of the broad original claims, respondent was confronted with a further choice. It might, under the decisions of this Court, have tested that question further by another suit in another circuit,¹ or it could abandon its claim to a monopoly broad enough to cover both the triode and diode control systems devised by Wheeler, restricting its claim to the diode system set forth in the original patent as the preferred embodiment and of which the particular advantages had therein been pointed out. Respondent's decision was to restrict its claim to that specific kind of automatic volume control which made use of a diode united with a high resistance to derive the control potential directly from the amplified energy of the received signal. This retreat from the broad assertion of monopoly restricted the reissue patent to a narrower compass, and opened to general use a correspondingly wider field, than the adjudicated claims. So restricted, the subject matter covered by the reissue patent is not a basic invention, but rather one of the "last step" variety in which final simplicity of means exactly adapts the device to the desired end.²

¹ *Triplett v. Lowell*, 297 U. S. 638, 642; *Maytag Co. v. Hurley Machine Co.*, 307 U. S. 243, 245.

² See *Diamond Rubber Co. v. Consolidated Tire Co.*, 220 U. S. 428, 434-5, 440-1; *Clough v. Manufacturing Co.*, 106 U. S. 178, 180; *The Barbed Wire Patent*, 143 U. S. 275, 282-3; *Topliff v. Topliff*, 145 U. S. 156, 163-4; *Richmond Co. v. United States*, 275 U. S. 331, 338-9.

On September 3, 1935, thirty-five days after the filing of the opinion of the Second Circuit Court of Appeals, respondent filed in the reissue application an amendment cancelling original claims 1, 5, and 6, and amending original claim 10 to include, among other changes, the high resistance (III, 1078 and 1080). The original oath filed with the application for reissue had been held insufficient (III, 1076), and the amendment was accompanied by a new oath (III, 1102-6). The new oath was accepted by the Patent Office and in due course the reissue was granted (Agreed Finding 7, II, 842). During the prosecution of the reissue application the Patent Office was fully informed of the litigation in the Second Circuit, and had copies of Judge Galston's opinion and of the opinion of the Court of Appeals (Agreed Finding 9, II, 842). The reissue claims were granted in the light of that litigation and with knowledge of the prior work of Evans, which all now agree was the closest approximation to Wheeler's invention (Opinion of C. C. A. 6, III, 1480; also see I, 247 and *post*, pp. 47-53). It is quite incorrect to suggest, as petitioner's counsel do (brief p. 35), that this action of the Patent Office had any purpose or effect to reverse the decisions of the courts in the Second Circuit. On the contrary, those decisions were given full recognition, for the effect of the reissue was to relinquish all claim of monopoly of the broad subject matter which those courts held to be unpatentable.

It is agreed that the patent thus reissued is one in which the scope of the claims is narrowed (see I, 259-60). It is not a broadening reissue. The original patent was "wholly or partly inoperative or invalid" because the patentee had claimed "more than he had a right to claim as new" (R. S., Sec. 4916) and the reissue was granted for the "plain purpose" of the statute "to give the patentee an opportunity to make valid and operative that which was before in-

valid and inoperative; invalid, because it claimed as new that which had been previously invented or used by the public; inoperative, because the specification was defective or insufficient."¹

It was conclusively established at the trial of the instant case that the inventor, in drafting and accepting the original claims not commensurate with the invention, acted without fraudulent or deceptive intention and without intending to claim more than was new. The trial judge made the finding, *agreed to by counsel for both parties*, that "the application for the original patent and the application for the re-issue were prepared and prosecuted" by the solicitor in close collaboration with the inventor "honestly without fraudulent or deceptive intention, and without intending to claim as Wheeler's invention or discovery more than he had a right to claim as new" (Agreed Finding 19, II, 844-5).

On these facts the trial court in the case at bar reached the conclusions:

1. That the reissue patent was legally issued in accordance with the provisions of the reissue statute (Conclusions of Law, II, 845-6), and

2. That the Wheeler diode system of automatic volume control as described and claimed in the reissue patent was new at the date of Wheeler's reduction to practice of his invention, January 2, 1926; that Wheeler was the first, sole and original inventor thereof, and that the system is an invention and is patentable (Conclusions of Law, II, 856).

The decision of the trial court was affirmed in every particular by the Sixth Circuit Court of Appeals. The propriety of the reissue is discussed in the opinion of that court at pages 1471 to 1476 of volume III of this record.

¹ *McCormick Machine Co. v. Aultman*, 169 U. S. 606, 610.

The patentability of the Wheeler system of automatic volume control including a diode united with a high external resistance is discussed at pages 1476 to 1480.

The Reissue Patent Was Properly Granted

Point III of petitioner's brief is that "The Wheeler reissue patent is invalid as having been improvidently granted by the Patent Office, because it was unwarranted by the reissue statute" (p. 32). This point is developed by petitioner under four headings (A), (B), (C) and (D) (pp. 35-51).

(A)—The first heading is: "The invalidity of the original patent, because it did not disclose a patentable invention, could not be cured by reissue".

Petitioner's counsel point out (p. 35) that the grant of a reissue is limited by the statute to "the same invention" and advance "as a matter of simple logic" the proposition that "if a patent has been adjudicated invalid because it discloses *no* patentable invention, obviously, reissuance of the patent cannot make the invention patentable" (emphasis theirs). It is certainly true that a patent "invalid because it discloses *no* patentable invention" cannot be cured by reissue, since no new matter for which the quality of invention might be asserted can be added to the patent by reissue and no change in the claims however great can supply patentability to a disclosure that lacks invention. An adjudication, therefore, that the whole disclosure of an original patent is without invention is a judicial determination of the same question of fact that will underlie the patentability of the reissue patent. If on the other hand the antecedent judgment on the original patent has extended to only a part of the whole disclosure, defined let us say by broader claims of the original patent, then the question of fact adjudicated in the original case will

be, as it is in the instant case, a quite different question of fact from that which underlies the patentability of the restricted claims of the reissue.

This difference in the relation of the factual determination in the litigation on the original patent to the factual determination that has to be made in the subsequent litigation on the reissue patent, has been fully recognized in the decided cases in which the effect in litigation on a reissue patent of an earlier judgment invalidating the original patent has been considered. Those cases fall clearly into two groups, depending upon whether the original adjudication has been that there was no inventive subject matter disclosed anywhere in the original disclosure, or whether the original adjudication has been merely that some part of the original disclosure, defined in particular claims of the original patent, is anticipated or wanting in invention. The *Penn Electrical* case in the Third Circuit Court of Appeals¹ cited by petitioner (brief, p. 36)² is in the first group, wherein the antecedent decision was that there was no invention disclosed anywhere in the original patent. The *Van Kannel* case and the *Maitland* case³ upon which the Sixth Circuit Court of Appeals based its decision in the

¹ *Penn Electrical, etc. Co. v. Conroy*, 185 Fed. 511, C. C. A. 3.

² The other two cases upon which petitioner relies, *Erikson v. Frink Co.*, 16 F. (2d) 498, decided by Judge Anderson in the District of Mass., and *Traitel, etc. Co. v. Hungerford, etc. Co.*, 16 F. (2d) 495, decided by Judge Goddard in the Southern District of New York (petitioner's brief, pp. 35-6) are district court cases which were reversed, respectively by the First Circuit Court of Appeals and the Second Circuit Court of Appeals on the very point in issue (see *post*, pp. 25-26).

³ *Van Kannel, etc. Co. v. Winton, etc. Co.*, 276 Fed. 234, C. C. A. 6; *Maitland v. Goetz*, 86 Fed. 124 C. C. A. 2.

case at bar lie in the other group, wherein the antecedent judgment of invalidity went to only a part of the whole disclosure of the original patent.

In the *Penn Electrical* type of case, the original patent held invalid usually relates to a simple device or process presenting a single inventive feature basic in every variation of the device disclosed however defined and whatever its environment. In such cases the subject matter of the claims is commensurate with the whole subject matter of the disclosure and the court passes upon the inventive quality of the entire content of the original patent specification.

In the *Van Kannel* type of case the patents involved are usually of greater complexity. The disclosure of the patent will often contain in addition to the broad aspects of the invention, limited concepts, related to the broad invention, but having a distinct and separate life of their own. These narrower concepts may present novelty and invention even where the broader aspects of the invention are found to be old or unpatentable over the prior art. In such cases, where only generic claims defining the broad invention are in suit, the courts direct their decision to the inventive quality of the broad invention set forth in these claims without investigating the patentability of the narrower concepts set forth in the disclosure.

That this procedure, differentiating between the part of the subject matter defined in particular claims and the whole of the subject matter disclosed within the four corners of the patent, is a logical and proper procedure is clear, since no broader finding is necessary to a complete adjudication. As this Court said in *Russell v. Place*, 94 U. S. 605, 609, with reference to the effect of a judgment holding the original patent infringed as an estoppel on a suit on the reissue:

"The validity of the patent was not necessarily involved, except with respect to the claim which was the basis of the recovery."

That distinction between the whole and a part of the subject matter disclosed and intended to be claimed in the original patent is, of course, maintained in the reissue statute¹ with its provision for correcting patents "partly inoperative or invalid . . . by reason of the patentee claiming as his own invention or discovery more than he had a right to claim as new"; and in the related provisions of the disclaimer statutes², with their provisions that a patent claiming more than that of which the patentee was the original or first inventor or discoverer "shall be valid for all that part which is truly and justly his own" (Sec. 4917) and that he may maintain a suit at law or in equity for the infringement "of any part thereof, which was bona fide his own," unless "he has unreasonably neglected or delayed to enter a disclaimer" (Sec. 4922).

In the case at bar we are not concerned with cases of the *Penn Electrical* type, since the present case lies in the group typified by the *Van Kannel* case. The factual adjudication of the invalidity of the broader original claims by the Second Circuit Court of Appeals was not an adjudication of the facts which underlie the question of validity of the restricted claims of the reissue.

But if this Court in the instant case intends to pass upon the effect of an antecedent judgment holding claims of an original patent invalid for lack of invention upon a subsequent litigation on the reissue patent, it will perhaps be interested to trace the judicial differentiation between the two types of cases, which began very early in the devel-

¹ R. S., Sec. 4916, Appendix, p. 80.

² R. S., Sec. 4917, 4922, Appendix, p. 81.

opment of the law on this subject and has been followed ever since.

The earliest relevant decision, *Jones v. McMurray*, 2 Hughes 527, 13 Fed. Cas. 989, C. C. D. Md., decided in 1877, was an example of the *Penn Electrical* type of case. It involved two reissue patents to Jones' assignor Winslow. In an earlier decision invalidating the original patents for lack of novelty, this Court had said (*Sewall v. Jones*, 91 U. S. 171, 183) that "the substance of all that is found in Winslow's patent" was old. In dismissing the bill on the reissue patents Circuit Judge Bond said (13 Fed. Cas. 990) that since this Court had "determined that the original patents above named were void for want of novelty" he was "saved the labor of investigating their validity". It was urged on behalf of the complainant Jones that the patents had been reissued by the Commissioner of Patents "because the originals were invalid merely 'by reason of a defective or insufficient specification' under Sec. 4916 Rev. St. U. S.," but Judge Bond pointed out that the earlier decision of this Court had held that the patents "were void for want of novelty, and not merely invalid for want of a proper specification and description of Jones' claim". Judge Bond said (p. 990):

"While we are of the opinion that the decision of the Supreme Court in *Sewall v. Jones* is much broader than the complainant admits, and that it goes to the whole invention there and now claimed by Jones in the patents we are here considering, and that it determined that both the process and product now claimed by Jones was the invention of Appert, in France, and Durand, in England, more than sixty years ago, and held that Jones' patents were void for want of novelty, and not merely invalid for want of a proper specification and de-

scription of Jones' claims, nevertheless, since the Commissioner of Patents has reissued the patents to Jones, we would give him the benefit of them could we discover in what respect they differed essentially or substantially from the originals, which the Supreme Court has decided were not novel. There is no essential difference, however, between the process described in patent 35,274 and its reissue, No. 7061."

"The process described in the reissue is substantially that of the original patent. But if we admit there is something new and patentable in the reissued patent which was not in the original, the patent is void, because it is not for the same invention as the original. * * * It cannot, therefore, be claimed that the reissued patent contains anything which the original one did not, and the original, says the supreme court, is void for the want of novelty."

The question next arose in 1885 in the case of *Mathews v. Flower*, 25 Fed. 830, C. C. E. D. Mich. In that case the claims of the original patent had been held invalid by this Court on the ground that the claims covered more than the patentee had a right to claim as new in view of what was previously known and in public use (*Mathews v. Machine Co.*, 105 U. S. 54, 58-9). Circuit Judge Brown, in sustaining the reissue patent, emphasized the distinction between this situation and the situation in *Jones v. McMurray*, saying (25 Fed. 830-1):

"We proceed to take up the [defendant's] several pleas in their order.

2. That patent No. 96,959, the original of the reissue in suit, has been declared void by the Supreme Court in the case of *Mathews v. Machine*

Co., and consequently the complainants had no patent to amend when they applied for this reissue, and the same is void. It is true that the opinion of the Supreme Court was that this patent could not be sustained because the claim was too broad; but such are precisely the patents which, by Rev. St. §4916, the Commissioner is authorized to reissue; that is, in the language of the act: 'Whenever * * * any patentee claiming as his own invention or discovery more than he had a right to claim as new.' If defendants' proposition were sound, the whole provision with respect to reissues would be nullified. The case of *Jones v. McMurray*, 2 Hughes 527, is not controlling. In that case the Supreme Court had declared the whole invention disclosed in the original patent void for want of novelty, and not merely invalid for want of a proper specification and claim, as in this case."

These two decisions illustrate clearly the distinction between the two types of judgments encountered. In the *Jones* case the original patent had been declared invalid *in toto* for failure to disclose any patentable invention. The claims were commensurate with the whole subject matter disclosed in the specification, but it had been held that within that whole subject matter there was no invention. Since that defect could not be cured by reissue without violating the statutory provision that the reissue patent must be "for the same invention" as the original, the factual conclusion of this Court that there was no invention in the original disclosure was a decision of the same issue of fact that determined the validity of the reissue patent which was the subject of the second suit. Judge Bond, feeling himself bound by this conclusion of his superior court, dismissed the bill as soon as he had satisfied himself that the subject matter of the reissued patent was not different from

the subject matter which this Court had found to be without invention. In the *Mathews* case, on the other hand, the decision of this Court in the earlier suit on the original patent did not go beyond the validity of the original claims in suit, and rested on the ground that those claims defined more than the patentee was entitled to claim as new. Since this is a defect to which the reissue statute by its very terms is directly applicable, provided the original disclosure contains inventive matter insufficiently defined by the original claims, the reissue patent was providently granted and its new claims presented a different question of invention which was entitled to new and independent consideration in the second suit.

This distinction, perceived by Judge Brown in 1885, has been consistently observed and applied by the lower federal courts, without conflict, in every case since decided. The *Van Kannel* case and the *Maitland* case upon which the Sixth Circuit Court of Appeals rested its decision in the case at bar are instances. We cite in the margin¹ a number of other cases in which the courts have sustained reissue patents with narrowed claims confining the monopoly to an inventive advance disclosed but not properly claimed in the original patent, although the claims of the original patent

¹ *Electrical Accumulator Co. v. N. Y., etc. Co.*, 50 Fed. 81 C. C. S. D. N. Y.; *Thomson-Houston Electric Co. v. Black River etc. Co.*, 135 Fed. 759 C. C. A. 2; *Edison v. American Mutoscope & Biograph Co.*, 151 Fed. 767, C. C. A. 2. *Motion Picture Patents Co. v. Laemmle*, 214 Fed. 787, D. C. S. D., N. Y.; *Fehr et al. v. Activated Sludge, Inc.*, 84 F. (2d) 948, C. C. A. 7; *Philad Co. v. William Rader*, 15 F. Supp. 509, D. C. E. D., N. Y.; *Philad Co. v. Modernistic Permanent Wave Machine Co.*, 31 U. S. P. Q. 13, D. C. D. Minn., and *Rolscreen Co. v. Abraham & Straus, Inc.*, 38 U. S. P. Q. 523, D. C. E. D., N. Y. This case was reversed on the ground of lack of invention without reference to the issue under discussion at 105 F. (2d) 962.

had previously been declared invalid because of anticipation or for lack of invention.

Thus it is clear that there is no conflict between the two lines of decisions. The effect of the earlier judgment invalidating the original patent in the subsequent litigation on the reissue depends always on the identity or non-identity of the issues involved in the two cases. In the *Van Kannel* type of case the issues of patentability involved in the suit on the original and in the suit on the reissue are different and for that reason the former decision is not relevant (either as *res adjudicata* or under the doctrine of comity) in the suit on the reissue. In the *Penn Electrical* type of case the factual issue in the two suits is necessarily the same since the former decision fully explored all possible aspects of patentability in the disclosure of the original patent. No new factual issue of patentability can arise unless the reissue contains new matter, in which event it would be invalid on that ground.

From the foregoing it will be seen that there is in the case at bar no such issue as is postulated in petitioner's brief (p. 35) by the statement that "The invalidity of the original patent, because it did not disclose a patentable invention, could not be cured by reissue" (emphasis ours). Having misstated the issue, counsel claim to find support for their proposition in the two district court decisions in the *Erikson* and *Traitel Marble*¹ cases (both of which were reversed on appeal) and in the *Penn Electrical* case above discussed. It is really not important for the adjudication of the case at bar to inquire whether those cases support, within the class of cases in which the original adjudication

¹ *Erikson v. Frink Co. Inc.*, 16 F. (2d) 498, D. C. Mass.; reversed, 20 F. (2d) 707, C. C. A. 1; *Traitel Marble v. Hungerford Brass & Copper Co.*, 16 F. (2d) 495, S. D. N. Y.; reversed, 18 F. (2d) 66, C. C. A. 2.

went to the whole of the disclosure of the original patent, the proposition that the original adjudication makes improvident the granting of any reissue. But the fact is that even in that type of case, petitioner's contention finds no support. The decision in the *Penn Electrical* case was founded on the doctrine of *res adjudicata*, and the dictum in that case which went beyond that doctrine has been robbed of all effect by subsequent decisions, so that all the decisions in that line of cases may be summed up by saying that the antecedent adjudication on the original patent has exactly the same force and effect in the subsequent suit on the reissue as it would have in a subsequent suit on the original patent. If the suit is between the same parties it is *res adjudicata*. If the second suit is against other parties the original decision has only the effect to which it is entitled under the rule of comity. Thus in the *Traitel Marble* case (18 F. (2d) 66), the Second Circuit Court of Appeals reversing Judge Goddard pointed out (p. 69) that the former decision on the original patent only concludes the parties to the suit, so that in a second suit against other parties, whether on the original patent or a reissue thereof, the issues previously decided are open for reconsideration. The Court characterized the decision in the *Penn Electrical* case as being an example of "*res judicata* in the strict sense." Judge Anderson's decision in the *Erikson* case, from which petitioner's counsel quote at pages 35-6 of their brief, was likewise reversed on appeal¹ and with like effect.²

¹ *Erikson v. Frink*, 20 F. (2d) 707, 712.

² This limitation of the effect of the decision on the original patent to the scope of the doctrine of *res adjudicata*, has since been applied by the First Circuit Court of Appeals in *Rancourt v. Panco Rubber Co.*, 46 F. (2d) 625; 67 F. (2d) 790. In that case the court pointed out that the earlier decision on the original patent cannot be a bar to the subsequent suit on the reissue even between the same

But irrespective of what may be the effect of the judgment on the original patent in a case of the *Penn Electrical* type, petitioner's proposition and discussion under this heading have no application here since our case is of the *Van Kannel* type. The fact situation in our case, as we have seen, clearly places it in the *Van Kannel* line of cases. The Second Circuit Court of Appeals did not hold that the specification of the original Wheeler patent disclosed no patentable invention; it did not adjudicate the patentability of the automatic volume control in radio broadcast receivers using a diode united with a high resistance to derive the control potential directly from the amplified energy of the received signal, which is the subject of the present litigation. That subject-matter was not considered.

The Sixth Circuit Court of Appeals correctly concluded, therefore, that the decision as to the propriety of the reissue in the case at bar was controlled by the rule of the *Van Kannel* case and not by the *Penn Electrical* case. The court said (III, 1472-3, 1474):

"Also in the *Penn Electrical & Mfg. Co.* case the court stresses the fact that the 'vice' of the original patent was not that a patentee had claimed as new more than he had a right to claim, from which observation an inference might well be drawn that in such case the Third Circuit would have held the reissue valid. Here the reissue patent was applied for on that specific ground. The court in the *Hazeltine* case (7 Fed. Supp., at 914), had stated that Wheeler, in the original patent, had claimed more than he had a right to claim as new, and Wheeler,

parties until a finding has been made by the court in the second suit that the invention described in the reissue is in fact the same as that described in the original patent. This rule has also recently been applied by Judge Nields in the District of Delaware, in the Third Circuit. *B. F. Goodrich Co. v. American etc. Co.*, 23 F. Supp. 682, 684-5.

in his application for reissue, conceded the fact and relied on it. We conclude that the *Penn Electrical & Mfg. Co.* case is not controlling here.

A ruling diametrically opposed to that sought by appellant [petitioner], to the effect that a valid reissue may be granted where the original patent has been declared invalid, was announced by this court in *Van Kannel Revolving Door Co. v. Winton Hotel Co.*, 276 Fed. 234."

"This case is squarely controlling here. Wheeler introduced no new matter, and the application for reissue showed that the claims as originally drafted were not commensurate with the invention."

Upon thoughtful consideration it will be apparent, we think, that petitioner's attempt to apply to the case at bar the *dictum* of the *Penn Electrical* case is in effect to take the position that the remedial benefits of the reissue statute, extended by express terms to any patentee who by mistake and without fraudulent or deceptive intent has taken a patent which is "wholly or partly inoperative or invalid . . . by reason of the patentee claiming as his own invention or discovery more than he had a right to claim as new", are to be denied to the patentee whenever inoperativeness or invalidity has been judicially determined. It is, in effect, to say that the patentee forfeits his right to reissue by testing the validity of the original claims in a court of competent jurisdiction. And that is, in fact, the thought which underlies the propositions advanced by petitioner's counsel under the other sub-headings (B), (C) and (D) of its Point III (brief pp. 37-51 incl.). We discuss this underlying thought and the applicable law at pp. 35-38 in connection with petitioner's subheading (D).

(B)—Petitioner's second item with respect to the alleged improvidence of the grant of the reissue is (brief, p.

37) that "The reissue patent was improvidently granted by the Patent Office, because no facts were presented with the application therefor from which it could have been determined that 'inadvertence, accident or mistake' occurred in the procurement of the original patent."

The fact is that the amended and supplemental oath filed by the applicant on September 3, 1935 (III, 1102-6), following a ruling of the examiner that the original oath was insufficient (III, 1076), asserts that the original patent was, in the applicant's belief, "partly inoperative and invalid by reason of a defective and insufficient specification and claims and by reason of the patentee claiming as his own invention or discovery more than he had a right to claim as new" (III, 1103); that "the parts improperly claimed in said patent are original claims 1, 5, 6, 9 and 10" and that "the defect or insufficiency in the specification which renders said patent partly inoperative arose as follows from inadvertence, accident or mistake without any fraudulent or deceptive intention on his part" (III, 1103-4) and it proceeds to set forth in detail the circumstances attending the making of the invention, the filing of the original application with its full disclosure of the radio receiving set the inventor had built during the Christmas holidays of 1925, wherein the automatic volume control system included a diode united with a high resistance, and with its accompanying disclosure of other circuits using a triode arrangement for automatic volume control; the fact that the original claims seemed to him to define and protect his invention; that it was not until Judge Galston's decision that he was apprised that certain of his claims "did not define his invention and did not distinguish from what others had done" and that said patent did not have sufficient and proper claims to protect his invention; that he thereupon filed the application for reissue; that subsequently Judge Galston's

decision was affirmed by the Circuit Court of Appeals, and that the amendment to the specification and claims submitted with the amended and supplemental oath had been made in the light of these opinions of the courts, so as to assure that the claims in the reissue application accurately define what he had invented and disclosed and had thought was protected by the original patent.

At the trial petitioner's counsel freely and voluntarily approved the agreed finding of fact that "The application for the original patent and the application for the re-issue were prepared and prosecuted" by the inventor and his solicitor "honestly without fraudulent or deceptive intention, and without intending to claim as Wheeler's invention or discovery more than he had a right to claim as new" (Agreed Finding 19, II, 844-5).

As to this the Sixth Circuit Court of Appeals said (III, 1475):

"This finding of fact disposes of any issue of fraud or deception. If as a matter of law drafting claims not commensurate with the invention revealed in the specifications constitutes inadvertence, unless deliberate or fraudulent, then the essential facts were set forth in the application for reissue, and in the amended and supplemental oath. But the fact that Wheeler unintentionally and in reliance upon his solicitor drafted or accepted claims not commensurate with the invention disclosed in the specifications, constitutes an inadvertence within the meaning [fol. 1477] of the statute. *American Automotoneer Co. v. Porter*, 232 Fed. 456, 460 (C. C. A. 6); *Van Kannel Revolving Door Co. v. Winton Hotel Co.*, supra. There is no conclusive evidence here, such as existed in the *Union Switch & Signal Co.*, case, supra, that there was no accident, inadvertence or mistake, and upon this point we see no reason for overruling the decision of the Patent Office. Cf.

Cincinnati Rubber Mfg. Co. v. Stowe-Woodward, Inc. 111 Fed. (2d) 239, 242 (C. C. A. 6).²¹

While we think that this Court must agree with that conclusion, yet a reckless charge of fraud has an odor that moves us to add the following remarks:

In his supplemental oath Mr. Wheeler said that he was not versed in the construction of patent claims. Petitioner's counsel say that this assertion was false because it appears that Wheeler had considerable experience in pat-

¹ In addition to these authorities upon which the Sixth Circuit Court of Appeals predicated its decision, we call attention to the following additional citations: *Topliff v. Topliff*, 145 U. S. 156, 171; *Miller v. Brass Co.*, 104 U. S. 350, 352; *Mahn v. Harwood*, 112 U. S. 354, 362, and *Crown Cork & Seal Co. v. Aluminum Stopper Co., et al.*, 108 Fed. 845, 852-3, 860-1, C. C. A. 1901; *Houghton v. Whittin Machine Works*, 153 Fed. 740, 746-7, C. C. A. 1907; *Money-weight Scale Co. v. Toledo Computing Scale Co.*, 187 Fed. 826, 831, C. C. A. 1911; *Robert v. Krementz*, 243 Fed. 877, 881-2, C. C. A. 1917; *Autopiano Co. v. American Player Action Co.*, 222 Fed. 276, 281, C. C. A. 1915; *Iowa Washing Machine Co. v. Montgomery Ward*, 227 Fed. 1004, 1006-7, D. C. S. D. N. Y., 1915; affirmed C. C. A. 2, 234 Fed. 88, 89; *Bucher & Gibbs Plow Co. v. International Harvester Co.*, 211 Fed. 473, 476, D. C. N. D. Ohio, E. D.; *Perfection Disappearing Bed Co. v. Murphy Wall Bed Co.*, 266 Fed. 698, 699, C. C. A. 1920; *Gross v. Norris*, 18 F. (2d) 418, 422, D. C. D. Md., 1927; affirmed C. C. A. 4, 26 F. (2d) 898; *Pehr et al. v. Activated Sludge, Inc.*, 84 F. (2d) 948, 950, 1, C. C. A. 1936, and *Motion Picture Patents Co. v. Laemmle*, 214 Fed. 787, 794, D. C. S. D. N. Y., 1914, in which Judge Julius Mayer clearly and briefly expressed the rule, as follows (p. 794):

"It is far from simple to fix on phraseology for patent specifications and claims which will successfully resist attack, and where, as here, there was no fraud or deceptive intention, and the patentee claimed more as new than he was entitled to such error was clearly due to that inadvertence, accident, or mistake in respect of which the statute was intended to afford relief."

ent matters as an inventor and patentee and as a patent expert in radio patent litigation. Of course it does not follow that he was versed in the construction of patent claims. It is no part of the duty of a patent expert to interpret patent claims; and a patentee is obliged to rely upon the advice of his solicitor as to the construction that may be put upon the claims of his patent by the courts. In this case his solicitor's advice in that regard turned out to be wrong—at least according to the opinion of the Circuit Court of Appeals for the Second Circuit. That situation contains no element of fraud.

Petitioner's counsel's further charge of fraud has to do with the assertion in the oath that the revision of the specification and claims that accompanied the application for reissue was undertaken to correct the insufficiency of which the patentee had become apprised by Judge Galston's decision, namely, "that certain of these claims did not define his invention and did not distinguish from what others had done, and that said patent did not have sufficient and proper claims to protect his invention" (brief, p. 40). Counsel say that the supplemental oath asserted "*that this decision created an 'inadvertence, accident or mistake' in the procurement of the original patent*" (brief, p. 39, emphasis theirs). Of course the supplemental oath asserted nothing of the sort. The decision of Judge Galston did not create either "inadvertence, accident or mistake" nor was it the decision of Judge Galston that made the original patent "wholly or partly inoperative or invalid, by reason of a defective or insufficient specification, or by reason of the patentee claiming as his own invention or discovery more than he had a right to claim as new". That insufficiency was latent in the original patent, it came about by the patentee's acceptance of the original claims without fraudulent or deceptive intention and without intention to claim

more than he had a right to claim as new; and, as the oath asserted (III, 1105), the patentee first "became apprised" of the insufficiency by Judge Galston's decision, subsequently affirmed by the decision of the Second Circuit Court of Appeals.¹

It will be observed that the thought which really underlies petitioner's contention is that the patentee was remiss, and forfeited his right to a reissue, when he decided to test the validity of the original claims in a court of competent jurisdiction. This thought we show to be without substance (*post*, pp. 35-38).

(C)—Petitioner's third contention is that the reissue was improvidently granted "because the oath accompanying the application for reissue affirmatively establishes that no 'inadvertence, accident or mistake' occurred in connection with the issuance of the original patent, and the only material averments were false" (brief, pp. 43-8—emphasis theirs). Under this heading, which is no more than a paraphrase of the preceding one, petitioner's counsel merely repeat with ascending emphasis the assertion that the original oath was false. The reiterated charge of fraud is based upon the same two points that we have just discussed.²

¹ See the very pertinent remarks of Judge Shipman in *Pappenhusen v. Falke, et al.*, 19 Fed. Cas. 1052, 1055, quoted *post*, p. 35.

² Under this heading (p. 47) an additional charge of "utter falsity" is built up on the fact that claim 11 of the original patent (III, 1075), which was not in suit in the *Abrams* case in the Second Circuit, included a diode rectifier united with a high resistance. But that circumstance merely emphasizes the fact that the patentability of an automatic volume control system including a diode united with a high resistance was *not* litigated in the Second Circuit case. Whether that question might have been litigated in the *Abrams* case under claim 11 (which is limited in other respects) is irrelevant in the case at bar against another defendant.

Nothing is said about the agreed finding that both the application for the original patent and the application for the reissue "were prepared and prosecuted" by the patentee and his solicitor "honestly and without fraudulent or deceptive intention" (Agreed Finding 19, II, 844-5).

Here again the thought that underlies petitioner's argument is that because respondent chose to test the validity of the original claims by the judgment of a court of competent jurisdiction, before disclaiming them by reissue, it becomes "false" to say that the broad claims were put into the original patent "by inadvertence, accident or mistake". Petitioner's counsel say that the "error in judgment" of the patentee and his attorneys "in seeking to enforce the original patent" is "not an 'error' contemplated by the reissue statute" (p. 43). Of course it is not. The error contemplated by the reissue statute lay in the fact that the patentee and his attorneys by inadvertence, accident or mistake without fraudulent or deceptive intention made claims in the original patent for more than the patentee had a right to claim as new. The right to correct the patent by reissue was not forfeited by the fact that before the reissue the invalidity of the original claims was judicially determined (see *post*, p. 35).

(D)—Under this sub-heading petitioner contends that the Wheeler reissue patent is invalid because of laches in applying for it (brief, pp. 48-51). The contention is based upon the fact that although the reissue was applied for promptly after Judge Galston's holding of invalidity of the broad claims in the district court, respondent simultaneously prosecuted an appeal from that decision to the Circuit Court of Appeals for the Second Circuit. We think that this procedure introduced no element of laches into the case.

It is elementary law that in view of the presumption of validity raised by the grant of a patent by the Patent Office, a patentee is entitled to the judgment of a court of competent jurisdiction before conceding invalidity of any of his claims unless the invalidity is apparent on the face of the patent.¹ As long ago as 1862, in the case of *Poppenhusen v. Falke et al.*, 19 Fed. Cas. 1052, 1055, C. C. S. D. N. Y., Judge Shipman said:

"It not unfrequently happens, that a judicial interpretation of the specification or claim of a patent, or of both, discloses to the inventor and patentee, for the first time, the defects in the instrument, and shows him that he has unwittingly restricted his rights within narrower limits than his discovery, or has so inartificially described his invention, that he has failed to secure any substantial advantage by it. Such a disclosure furnishes a proper occasion for a surrender and reissue, when the error was inadvertent, and is clearly within the beneficent design of the statute."

Not only have reissue patents, applied for after a district court decision holding original claims invalid over the prior art, been sustained by the courts² but in a large number of cases reissue patents have been sustained over the defense of laches although application for reissue was not filed until after an adverse decision on the original patent

¹ See *Robinson on Patents* 1890, Vol. 2, p. 284 quoted with approval by this Court in *Ensten v. Simon, etc. Co.*, 282 U. S. 445 at page 453. In the instant case, since the invalidity of Wheeler's original claims was predicated solely on outside prior art references, it is plain that the invalidity did not appear on the face of the patent.

² *Electrical, etc. Co. v. New York, etc. Co.*, 50 Fed. 81 C. C. S. D. N. Y.; *Traitel Marble Co. v. U. T. Hungerford Brass & Copper Co.*, 18 F. (2d) 66, C. C. A. 2; *Fehr et al. v. Activated Sludge, Inc.*, 84 F. (2d) 948, C. C. A. 7.

by a Court of Appeals.¹ In the *Van Kannel* case cited in the margin the Court said with reference to this point:

"The statute does not fix any absolute period within which reissue must be applied for; the only inflexible requirement is that of reasonable diligence. *Mahn v. Harwood*, 112 U. S. 354, 5 Sup. Ct. 174, 6 Sup. Ct. 451, 28 L. Ed. 665; *Milloy Co. v. Thompson-Houston Co.* (C. C. A. 6), 148 F. 843, 78 C. C. A. 533. No rights of inventors have intervened. In the Circuit Court of Appeals for the Second Circuit (219 Fed. 741, 135 C. C. A. 439) the patent (claims 1, 2, 13 and 14) was held void December 15, 1914. This was the first final adverse holding. We think plaintiff was not bound before that decision to apply for reissue."

This Court has applied a similar rule in the case of disclaimers. The disclaimer statutes,² in almost the same words as the reissue statute,³ provide that "Whenever, through inadvertence, accident, or mistake, and without any fraudulent or deceptive intention, a patentee has claimed more than that of which he was the original or first inventor or discoverer, his patent shall be valid for all that part which is truly and justly his own, . . . and any such patentee, . . . may . . . make disclaimer of such parts

¹ *Mathews v. Flower*, 25 Fed. 830, C. C. E. D. Mich.; *Maitland v. B. Goetz Mfg. Co.*, 86 Fed. 124, C. C. A. 2; *Edison v. American Mutoscope & Biograph Co.*, 151 Fed. 767, C. C. A. 2; *Motion Picture Patents Co. v. Laemmle et al.*, 214 Fed. 787, D. C. S. D. N. Y.; *Van Kannel Revolving Door Co. v. Winton Hotel Co.*, 276 Fed. 234, 239, C. C. A. 6; *Philad Co. v. Rader*, 15 F. Supp. 509, D. C. E. D. N. Y.; *Philad Co. v. Modernistic Permanent Wave Machine Co.*, 31 USPQ 13, D. C. Minn.

² R. S., Sec. 4917, U. S. C. Title 35, Sec. 65, and R. S., Sec. 4922, U. S. C. Title 35, Sec. 71, see Appendix, p. 81.

³ R. S., Sec. 4916, U. S. C. Title 35, Sec. 64, see Appendix, p. 80.

of the thing patented as he shall not choose to claim or to hold by virtue of the patent . . .” And this provision is subject to the condition of R. S. 4922: “But no patentee shall be entitled to the benefits of this section if he has unreasonably neglected or delayed to enter a disclaimer.” The identity between the disclaimer statutes and the re-issue statute governing the present case is obvious. The elimination from an original patent by disclaimer of something more than the patentee had a right to claim as new is not distinguishable, in any respect relevant to the present discussion, from a reissue which cancels broad claims covering more than the patentee had a right to claim as new and substitutes therefor claims truly commensurate with his invention.¹ The decisions cited in the margin, holding disclaimers timely though not entered until after a decision of invalidity rendered by a court of last resort, are therefore, directly in point.²

The case relied on by petitioner, *Milloy Electric Co. v. Thomson-Houston Electric Co.*, 148 Fed. 843, C. C. A. 6, discloses a situation in which the patentee failed to apply for reissue until the original patent had been held invalid in three separate decisions by courts of appeals. The court there held that in adopting the course of relitigating the original patent in the same and in other circuits, in a pro-

¹ See *Robinson on Patents*, Vol. 2, Sec. 641, page 279.

² *Triplett v. Lowell*, 297 U. S. 638; *Ensten v. Simon, Ascher & Co.*, 282 U. S. 445, 453; *Gage v. Herring*, 107 U. S. 640, 646; *Silsby, et al. v. Foote*, 20 How. 378, 386-7; *Seymour et al. v. McCormick*, 19 How. 96, 106; *O'Reilly et al. v. Morse et al.*, 15 How. 62, 121; *Cincinnati, etc. Co. v. Stowe-Woodward, Inc.*, 111 F. (2d) 239, 242 (C. C. A. 6); *France, etc. Co. v. Jefferson, etc. Co.*, 106 F. (2d) 605, 610-11, C. C. A. 6, 1939; *General Chemical Co. v. Standard Wholesale Phosphate & Acid Works, Inc.*, 77 F. (2d) 230, C. C. A. 4, 1935; *Excelsior, etc. Co. v. Williamson, etc. Co.*, 269 Fed. 614, 619; and see *Walker on Patents*, Deller's Ed. Vol. 2, pp. 1314-15, and cases there cited.

longed effort to overthrow the original decision of invalidity, the patentee elected to stand or fall by the validity of his original patent and rejected once and for all the alternative course of reissue. The ruling of the *Milloy* case cannot be applied to the totally different fact situation here presented. Moreover, it should be pointed out that both in the *Milloy* case and in a subsequent decision on the same reissue patent by the Court of Appeals for the Second Circuit, *Thomson-Houston Electric Co. v. Western Electric Co.*, 158 Fed. 813, it is plainly intimated that the reissue would have been sustained had the patentee made application for reissue promptly after the earliest Court of Appeals decision holding the original patent invalid.

We submit that there was no error in the conclusion of the Sixth Circuit Court of Appeals, expressed as follows (III, 1475-6):

"Nor is the reissue patent invalid because of laches in the application. The original patent was issued September 27, 1932, and the application for reissue was filed September 26, 1934. It was not until August 6, 1934, that the District Court in New York held the claims invalid, and Wheeler became aware for the first time of the possible necessity of cancelling the claims. The appellee was entitled to rely upon and litigate the original claims, and had a right to wait for the decision of the Circuit Court of Appeals before definitely abandoning them. *Cincinnati Rubber Mfg. Co. v. Stowe-Woodward Inc.*, supra; *France Mfg. Co. v. Jefferson Electric Co.*, 106 Fed. (2d) 605, 610 (C. C. A. 6); *Triplett v. Lowell*, 297 U. S. 638."

Conclusion as to Petitioner's Point III.

We respectfully submit, therefore:

1—That if the writ of certiorari herein was issued because of any supposed conflict between circuit courts of

appeals, then it should be dismissed for the reason that there has been no conflict as to the propriety of a reissue after part of the original patent defined by litigated claims, has been adjudicated to be invalid for lack of invention.

2—That if the writ was issued because of the fact that the effect upon a reissue patent of an antecedent judgment that claims of the original patent were invalid for lack of invention has not heretofore been precisely defined by this Court, then the decision of the Sixth Circuit Court of Appeals should be affirmed for the reasons above stated.

Petitioner's Points I, II and IV.

Petitioner's Point I is that "The Wheeler reissue patent is invalid, because of anticipation by and want of invention over the prior art" (brief, pp. 14-25); petitioner's Point II is that its accused radio broadcast receivers do not infringe (brief, pp. 35-42); and petitioner's Point IV is that it has intervening rights (brief, pp. 52-3). As we stated at the outset of this brief (*ante*, pp. 1-3) there are concurrent findings of the lower courts in the case at bar on each of these three questions, and there is no conflict between those findings and the judgment of the Second Circuit Court of Appeals. As to anticipation and want of invention, the Second Circuit Court of Appeals, as we have seen, passed on a different issue; as to infringement, the Second Circuit Court of Appeals made no ruling, and as to the alleged intervening rights, the question presented in the case at bar was not and could not have been presented to the Second Circuit Court of Appeals.

This Court has recently expressed itself as unwilling to consider the ordinary questions of patentability and infringement in patent cases where no necessity of recon-

ciling conflicting decisions of circuit courts of appeals exists. We have no reason to suppose that this Court will in the case at bar depart from the procedure it has heretofore followed.¹

Furthermore, as to the question of infringement and the question of intervening rights it seems to us that the petition for writ of certiorari herein did not, with respect to either of these two questions, contain any such statement of "the reasons relied on for the allowance of the writ", as Rule 38, Sec. 2 of this Court requires. The petition contains no separate statement of any of the "questions presented" but only a "Summary and Short Statement of the Matter Involved" (pp. 1-4) and "Reasons Relied Upon for the Grant of a Writ of Certiorari" (p. 5). As to patentable invention and propriety of reissue, apparently the "questions presented" are intended to be stated in the "reasons relied upon for the grant of a writ" (petition, p. 5), but these "reasons" do not mention infringement or intervening rights.²

If, however, this Court chooses to review the question of anticipation and want of invention, or the question of infringement, or the alleged intervening rights, respondent has no reason to shun such a review of the concurrent decisions of Judge Lederle and of the Sixth Circuit Court of Appeals on those questions. Indeed we believe that nothing could be more conducive to the progress of science and the useful arts in this country than a decision by this Court, at this time, upholding a circuit court of appeals decision which finds patentable novelty in a new combination of old elements producing a superior result.

^{1,2} *Keller v. Adams-Campbell Co.*, 264 U. S. 314, 319; *General Talking Pictures Corp. v. Western Electric Co.*, 304 U. S. 175, 178; *Connecticut Railway, etc. Co. v. Palmer*, 305 U. S. 493, 497; *Rorick v. Devon Syndicate*, 307 U. S. 299, 303; *Nat'l Licorice Co. v. N. L. R. B.*, 309 U. S. 350, 357.

We set forth, in the remainder of this brief, the matters of fact (with reference to such points of law as are appropriate) with respect to these questions. We believe they will clearly show that Wheeler's automatic volume control system employing the diode united with a high resistance was not anticipated; that it was the product of Wheeler's creative faculties, that petitioner has used it, and that there are no intervening rights.

The Disclosure of the Patent (III, 867-74).

The patentee says that his invention "relates to amplifiers, and more particularly to amplifiers utilized in modulated carrier-current signaling systems¹ wherein the limit of amplification is automatically maintained substantially at a predetermined level" (1a/1-5).² In other words, to radio broadcast receivers with automatic volume control. Automatic volume control is defined by the Institute of Radio Engineers as "a device which automatically reduces the total amplification of the signal in a radio receiver with increasing strength of the received signal carrier wave" (I, 470). By reducing the amplification of the signal, it keeps the volume of sound emitted by the loud speaker substantially uniform at the level chosen by the -

¹ This means radio broadcasting systems. A concise and accurate statement about radio broadcasting appears in the opinion of the Sixth Circuit Court of Appeals at the top of page 1477 of this record, Volume III. It shows why radio broadcasting is referred to as "modulated carrier current signaling."

² The patent is printed in two columns on each page with duplication of the line numbers in the two columns. Identification of a particular line thus involves identification of the column as well as the page. We use the letters *a* and *b* to refer respectively to the first and second columns of the page. Thus 1a/1-5 refers to page 1, first column, lines 1 to 5.

user of the set and established by his initial adjustment of the volume control knob, notwithstanding wide variations in the strength of the signal that comes to his receiving antenna. Many forms of automatic volume control have been suggested and patented. The subject matter of the patent in suit is a specific kind of automatic volume control which, because it has advantages found in no other system, has practically superseded all others (Finding 18, II, 853; and Conclusion of Law 3, II, 857).

The principal purposes are, as the patentee points out, to minimize distortion of the reproduced signal and prevent loud and harsh reproduction (1a/16-20) and, more specifically, to avoid the defect known as "blasting" (1a/21-37) and to compensate for the effect of "fading" (1a/38-54). The desirability of avoiding distortion of the signal (speech or music) is self-evident. The objectionable aspects of "blasting" and "fading" are correctly stated in the opinion of the Sixth Circuit Court of Appeals (III, 1477) as follows:

"Blasting is the term applied to the harsh and distorted sounds that came from a radio receiver of the earlier type, when the operator tuned from a weak to a strong station. When a weak signal was received, a high degree of amplification was employed in the receiver in order to make the weak signal audible at the loud-speaker. If this degree of amplification was retained when the operator tuned in on a strong station, the signal was over-amplified and the operator was compelled to adjust not only for tuning to wave length, but also for volume control. Fading was due to atmospheric conditions which caused signals to vary in intensity, changing from strong to very weak signals. Wheeler's invention secured automatic compensation for inequalities in the received radio-frequency signal, with corresponding

increase or decrease in the degree of amplification, so that the amplification of the strong signals would be toned down and the weak signals would be strengthened."

A complete radio broadcast receiver consists of a radio-frequency amplifier, a detector (rectifier), an audio-frequency amplifier, and a loud speaker (1b/6-11). The specification of the patent from page 1, second column, line 24 to page 2, second column, line 11 is a description "merely by way of example" (2a/37) of a standard form of radio-frequency amplifier (1b/27 to 2a/17), and audio-frequency amplifier (2a/53 to 2b/11), together with the remark that the detector employed "is a two-electrode rectifier [diode] which may be of the type commonly known in the art as a 'Fleming' valve, or may consist of an equivalent such as a three-electrode vacuum tube, [triode], as shown, having its grid 12 and its plate or anode 35 directly connected together to comprise in effect a single anode" (2a/18-24) i. e. to make it into a diode.

Then at page 2, second column, beginning in line 12 comes the disclosure of the main feature of the invention as follows (2b/12-22):

"In accordance with the main feature of the present invention the degree of amplification effected in the radio-frequency amplifying stages is automatically controlled by a biasing potential obtained by rectifying the modulated signal carrier in a two-electrode rectifier 33, having a resistance 51 connected between the filament 38 and the anode 35 of the rectifier, through which the pulsating rectified or converted current flows, thereby developing a negative voltage at terminal 52."

This sentence is followed by one which points out that the negative voltage is applied, after filtering out the audio-

frequency component, to the grid of the first radio-frequency stage, for the purpose of amplification control (2b/22-30). To "complete the description of the system illustrated in Fig. 1" the patentee gives specific values of condensers, resistances, etc., suitable for his purposes (2b/31-46), and he points out that the flow of current through the "high resistance 51" creates a negative biasing voltage which increases as the signal strength increases and decreases as the signal strength decreases so that when it is impressed upon the grid 11 of the amplifier 9 the amplified radio-frequency voltage and the volume of the reproduced signal is maintained substantially uniform under all conditions, at the level chosen by the user of the set by his initial adjustment of the volume controlling knob (2b/58-3a/23). The specification then continues with the description of the filtering system which serves to eliminate the audio-frequency modulation and the radio-frequencies from the control potential before it reaches the grid of the amplifier tube (3a/44-3b/15), and proceeds to an explanation of the curve Fig. 2 which graphically illustrates the effect of automatic volume control on the radio-frequency amplification (3b/29-47), and then there is described an embodiment of Wheeler's invention illustrated in Fig. 3 which differs from the embodiment illustrated in Fig. 1 in that the control potential is applied to the grids of two of the amplifying tubes, instead of to only one of the amplifying tubes as in Fig. 1 (3b/48-4a/51).

Then the patentee returns to the main feature of his invention and points out that "There are advantages attending the use, in connection with the present invention, of the two-electrode rectifier circuit typified by Figs. 1 and 3, which may not be apparent from the foregoing discussion" (4a/58-62). The first of these advantages is that the "rectified output voltage [control voltage] is directly

proportional to the applied alternating signal voltage [amplified modulated carrier voltage]" (4a/63-5) provided the signal voltage has been amplified to "a large operating voltage, say 10 volts" (4a/68), as in Wheeler's disclosed arrangement. This direct ratio of the control voltage to the signal itself, which results from Wheeler's method of deriving the control voltage directly from the signal by impressing the amplified signal voltage on a two-electrode rectifier associated with a high resistance (Kelley, I, 336), is graphically illustrated in Fig. 4 of the patent where the "linear" response of his system is contrasted with the non-linear response of other detectors, such as the three-electrode detector. The curve expresses the relation between the amplified signal voltage (A.C.) and the control voltage (D.C.) and it will be seen that except for very small signals (the lower left hand portion of the curve) Wheeler's arrangement gives a linear response in which the control voltage is always directly proportional to the amplified signal voltage; whereas with the other detectors there is no such relationship, the control voltage tending to reach an upper limit and there flatten out. As the patentee points out, his improved control system "maintains constant the average signal amplitude which is equal to the carrier wave amplitude and independent of the degree of modulation" (4b/23-6). In other words, the sound volume is automatically maintained at the level initially chosen by the user of the set, without impairing the desired contrast of the speech or music.

Further emphasizing the advantages of his system in which the control voltage is derived directly from the amplified signal voltage itself the patentee points out that "the control bias voltage is independent of the 'B' or anode battery voltage. Since the rectifier is not an amplifier, is not critical, and requires neither anode nor biasing

battery, no adjusting devices are required. This is not the case in three-electrode detector circuits in which an adjustment must be made, as by a potentiometer, to accommodate the control bias to any particular combination of tubes and 'B' voltage" (4b/29-38).

In petitioner's brief (p. 9-10) the subject matter of the Wheeler reissue patent is entirely misrepresented. It is there said that Wheeler's "supposed contribution" was to control the amplifying power of a vacuum tube amplifier in a radio signalling system "by regulating the negative bias on its grid . . . *automatically* by means of the signal current passing through the system . . . That, in brief, is the alleged invention of the patent" (emphasis theirs). All of the foregoing detailed disclosure of Wheeler's specific form of automatic volume control including the diode united with a high resistance is omitted from petitioner's brief. It was, however, upon this specific disclosure, that the Patent Office granted the restricted reissue claims after full consideration of the decisions on the original patent in the Second Circuit, and it was upon that specific disclosure and the extensive evidence given at the trial in regard to it that Judge Lederle based his finding that Wheeler gave evidence of inventive genius in "proposing to use a diode with a high resistance (high in relation to the internal resistance of the diode), in its output circuit as a rectifier for developing the automatic volume control potential. He proposed to impress on the diode, the same highly amplified carrier frequency signal potential that was supplied to the signal detector (about 10 or 12 volts) directly from the applied carrier voltage"² (Finding 7, II, 849); that this forward step by Wheeler "changed the re-

² See patent 4a/66-9; Wheeler I, 92-8; Hazeltine I, 202, 469; Notebook, Exh. 8, III, 905, off'd. I, 146.

ceiver by eliminating a triode rectifier with its separate batteries which had to be critically adjusted¹ and used the two-electrode (diode rectifier), with high resistance in its external circuit which he had devised on December 17, 1925" (Finding 10, II, 850); that Wheeler by this change produced the direct-current potential for biasing the amplifier grid "directly from the amplified and rectified signal", as distinguished from deriving it "from a source of energy in the plate circuit of a triode"² (Finding 20, II, 854), and that as a result of Wheeler's forward step "the control potential is created from the amplified signal itself without the interposition of any extraneous electromotive force" so that "the control potential is maintained directly proportional to the energy of the amplified signal itself"³ and "is independent of the characteristics of any particular diode tube"³ (Finding 23, II, 855). And it was upon this specific disclosure that the Sixth Circuit Court of Appeals affirmed Judge Lederle's decision that the Wheeler automatic control system including the diode united with the high resistance is a new combination of elements old in themselves but which produce a new and useful result (see Opinion, III, 1478-80).

Wheeler's Invention Was Not Anticipated.

It is agreed by everyone that the nearest approximation to Wheeler's invention is the work of Evans of the Western Electric Company disclosed in his patents

¹ See Wheeler I, 88, 93, 100-1, 111-13; Hazeltine I, 414-20; Kelley I, 314-15, 373.

² See Wheeler I, 93-4, 111-12, 176; Kelley I, 312, 315, 321, 328-9, 336; Hazeltine I, 414, 418-19, 427, 475.

³ See Wheeler I, 112, 176; Hazeltine I, 202, 421-2, 469; Kelley I, 373; Dunn II, 587; Johnston II, 562.

1,736,852 granted November 26, 1929 (III, 1277, off'd. I, 235) and 1,869,323 granted July 26, 1932 (III, 1294, off'd. I, 235), both based on an application filed September 24, 1923. The Evans disclosure was picked out by petitioner's expert as being the closest approximation to the Wheeler invention (I, 378). Respondent's expert agreed (I, 425). The trial court so found (Finding 20, II, 854), and the Court of Appeals affirmed (III, 1480).

The Disclosure of the Evans Patents. In their brief petitioner's counsel say (p. 15-16) that the specifications of the Evans patents "comprise a complete, detailed and clear exposition of everything disclosed by Wheeler" with "complete identity in purpose, instrumentalities, operation and result between the Wheeler and Evans patents". But the fact is that Evans discloses the triode arrangement with its auxiliary batteries for creating the control potential by the indirect controlling action of the signal energy. It contains no disclosure or suggestion of an automatic volume control system in which the control potential is derived from the signal energy through a diode united with a high resistance.

The finding of the trial court on this point is as follows (Finding 20, II, 854):

"In the Evans disclosure the direct current potential for biasing the amplifier grid is not as in Wheeler produced directly from the amplified and rectified signal but is derived from a source of energy in the plate circuit of a triode rectifier and the amount of potential derived from that source is controlled by applying the amplified modulated signal to the grid circuit of the triode rectifier. The control potential in the Evans arrangement is critically dependent upon the adjustment of the B battery and the C battery of the triode rectifier and, because the

triode rectifier has a non-linear characteristic in the Evans arrangement, impressing the modulated carrier on the non-linear triode rectifier causes the direct current biasing potential and hence the automatic volume control to be affected by the degree of modulation of the signal; and the system therefore impairs the desired contrast of the signal."

and (Finding 23, II, 855):

"... In the defendant's [petitioner's] receivers and in the Wheeler patent the control potential is created from the amplified signal itself without the interposition of any extraneous electromotive force. The result of this is that the control potential is maintained directly proportional to the energy of the amplified signal itself. This is desirable in an automatic volume control system. In the Evans patents, on the contrary, the amplified signal is used to control the electromotive force of an extraneous battery and to make the control potential out of that. In Evans there is the balancing of one battery against another in order to determine the control potential; in the Wheeler system and the defendant's [petitioner's] receivers the potential for automatic volume control is independent of the characteristics of any particular diode tube. In Evans the automatic volume control potential is dependent upon the characteristics of the particular triode tube used."

These findings are amply supported by the evidence (referred to in the footnotes, *ante*, p. 47) and they were affirmed by the Court of Appeals (III, 1479-80). Petitioner's counsel in their brief make no attempt to particularize the error, if any, in these findings of fact concurred in by the lower courts. Counsel admit that the system of automatic volume control illustrated in the drawing and described in Evans' patents is one in which

the triode arrangement is used (brief, p. 16, and see its expert's admission I, 241). But counsel say "the Evans patent plainly suggests that a diode can be utilized in lieu of a triode—were such a suggestion necessary in view of the common knowledge of the art that the use of a diode as a detector preceded the use of a triode for that purpose, and a diode was *never used except* as a detector." (p. 16—emphasis theirs).

We think that petitioner's attempt to spell out in the Evans patent specification the suggestion that a two-electrode detector might be used in lieu of the three-electrode detector (brief, pp. 16-17) is labored and unconvincing.¹ But however that may be, there is no point to the proposition. It is a mere man of straw.

¹ For instance, petitioner refers to Evans' claims (brief, p. 20) but Evans' claims are as silent with respect to a diode or a high resistance as is the Evans specification.

Also, petitioner argues (brief, pp. 18-19) that Wheeler in prosecuting his patent represented the triode and diode to be equivalents—but this is not so. Wheeler's original patent discusses at length the advantages of his two-electrode rectifier circuit over the three-electrode rectifier circuit (III, 1074A; lines 29-109). This differentiation was maintained throughout the prosecution. Petitioner's statement that Wheeler acquiesced in the rejection of all diode claims (brief, p. 18) is not true—at the time when such claims were canceled, they were canceled "without prejudice" (III, 1184) and other diode claims were later reintroduced (III, 1189). Also petitioner's statement that these claims were represented to be practically the same as the triode claims then in the case is not true. On the contrary, these claims were explicitly differentiated from the triode claims (III, 1190-1). The *Kissock* and *Hamilton* cases cited by petitioner are not in point. In both of them the patentee urged that certain prior art was not relevant in testing sufficiency of his invention, but the court held that it was relevant on the patentee's own admission. Here we admit the relevance of the triode circuit but differentiate from it.

As the Sixth Circuit Court of Appeals said (III, 1478-9):

"Appellant [petitioner] urges that there is no invention in the use of the diode as opposed to the triode; but Wheeler's device does not merely embody the diode. It discloses the use of the diode united with a high external resistance opposed to the relatively low internal resistance of the diode, with a consequent linear response which results in better automatic volume control than had ever before been secured. We agree with the District Court that this combination of the diode and the high resistance creating the negative bias at the grid in direct proportion to the amplified modulated carrier voltage is a new and useful improvement in the radio art, requiring the exercise of inventive genius. The device secures automatic volume control. The elements of the combination were old, but the combination was new, and the result was new. This constitutes invention. *Forestek Plating & Mfg. Co. v. Knapp-Monarch Co.*, 106 Fed. (2d) 554, 557 (C. C. A. 6)."

It is a fact that the two-electrode detector antedated the three-electrode detector. The three-electrode detector or audion is an offshoot of the Fleming valve by de Forest's addition thereto of the third (grid) electrode.¹ At the time of Wheeler's invention the Fleming valve [diode] as a radio detector had been superseded by the vastly superior triode (Wheeler I, 94; Kelley I, 331; Hazeltine I, 462), but research into the past history of the use of the diode as a detector produced evidence at the trial that it had been

¹ See the illustrated comparison in Judge Mayer's opinion in *Marconi etc. Co. v. deForest etc. Co.*, 236 Fed. 942, 953; the remark at the end of Judge Hough's opinion in that case in the Second Circuit Court of Appeals (243 Fed. 560, 567) and the illuminating review of the history of the two devices by Judge Woolley in the opinion of the Third Circuit Court of Appeals in *Westinghouse, etc., Co. v. deForest, etc., Co.*, 21 F. (2d) 918, 919-20.

used at low signal levels, that it had not been used with a high resistance in its circuit, and that it gave a non-linear response (Hazeltine, I, 462-3, 469; Kelley, I, 373, 330). The evidence further clearly established that linear response is not a characteristic of the diode itself. Linear response results from high initial signal level applied to the diode plus the high output resistance corresponding to Wheeler's resistance 51 (high in relation to the internal resistance of the diode) through which the rectified current flows and across which it builds up the controlling negative potential (Hazeltine I, 202, 418, 421-2, 493; Kelley I, 321, 328-9, 367-8, 369). There is no suggestion of these things in the Evans patents (Hazeltine I, 422).

In the expert evidence given at the trial on behalf of petitioner, there was no attempt to deny the utility of the linear response, which admittedly characterizes the Wheeler arrangement (Kelley I, 336), or that it depends upon both the high external resistance and the high signal level. Petitioner's counsel in their brief say (p. 21) that respondent's expert "*expressly admitted* that the Evans circuit would produce linear rectification (I, 489, 490)" (emphasis theirs). The fact is that the testimony there given by respondent's expert was that if in the Evans arrangement the signal was amplified to a sufficiently high level, and if the voltages of the B battery and the C battery were sufficiently increased and if the resistance in the circuit were made sufficiently high, then the triode arrangement might also be made to give a linear response. This matter was covered more fully by petitioner's expert Mr. Kelley and by the patentee, Mr. Wheeler. Such a transformation, Mr. Kelley said, would require an increase both of the B battery potential, that is, the battery 16 in Evans, and the C battery potential, the battery 17 in Evans (I, 335) but he

could not say that it had ever been done prior to Wheeler's invention (I, 335-6). Mr. Wheeler testified that at the time he filed his patent application in 1927 the triode detectors operated as square law detectors on small signal voltage; that about 1928 there was a tendency in the art to attempt to use the triode detector as a linear signal detector (not for automatic volume control) in radio broadcast receivers, the triode detector being operated with high signal voltage, high B battery voltage and a relatively large C battery or bias voltage, in order to get approximately linear detection over a limited range of signal voltages; that as a signal detector this had some advantages which caused it to be used for just a few years when its use died out because it still had the overloading limitation and the range of linear operation was not very great; that though the triode was thus used for a short time as a linear detector the arrangement was never used as a rectifier to secure automatic volume control potential (I, 497-8); that when the triode was used for automatic volume control it was in a different manner which did not give linear response, and that increasing the B and C battery voltages to give it more linearity would at the same time make it more critical and less suited for automatic volume control (I, 499, and see Hazeltine, I, 420-1).

The Affel Patent 1,574,780 and the Friis Patent 1,575,848—Both of these American Telephone & Telegraph Company engineers used, as Evans did, the triode rectifier. Their work falls short, therefore, of anticipating Wheeler's invention for the reasons just reviewed.¹ The Affel system

¹ Petitioner's counsel in their brief (pp. 23-4) emphasize that Affel in his patent and Friis in his, publish amplification curves identical with that of Figure 2 of Wheeler's patent. But these curves in all three cases are but graphs

(patent, III, 1246, off'd. I, 235) further falls short of Evans in that Affel "develops his control potential before amplification, and therefore, as appellant's [petitioner's] expert testified, cannot secure a signal strong enough for linear rectification" (C. C. A. 6, III, 1480; Kelley, I, 265, 375-6; Hazeltine I, 429-30). Friis beginning in the Fall of 1923 (Friis II, 640-1 and 654)—evidently later than Evans who filed his patent application in September of 1923—developed experimentally (II, 654 and 666) an automatic volume control system for radio telephone reception from ships. In this experimental work Friis, like Evans, imposed the entire amplified signal (carrier wave plus modulation) on a triode rectifier. Friis was aware that when the carrier plus the modulation was thus impressed on the triode rectifier the modulation would affect the automatic volume control and cause distortion, and this was recognized by him as a defect which he subsequently proposed, in his patent 1,675,848 (III, 1266, off'd. I, 235), to overcome by separating the carrier from the modulation (II, 663)—an idea that is also found in the earlier work of Affel (see *post*, p. 57). He did not, it will be observed, think of devising a rectifier with linear response which would handle the entire signal energy (carrier plus modulation) without distortion, as Wheeler afterwards did. The evidence is that the expedient which he resorted to in his patent would cut off the carrier energy from the automatic volume control system at all times except when the circuits of the receiver are closely tuned to the carrier-frequency of the particular incoming signal, and the result would be that instead of eliminating blasting it would bring about a

of the result which it was the common purpose of all three inventors to achieve—i. e., automatic amplification control. The graphs have no significance with relation to the means adopted by the three inventors to attain that result.

double blast as the set user in turning his dial knob tuned into and out of the carrier-frequency of each broadcast station; and when the set was slightly out of tune there would be no automatic volume control (Hazeltine I, 423-5).

Heising Patent 1,687,245 and Slepian Patent 1,455,768

—Neither of these patents discloses an automatic volume control system (C. C. A. 6, III, 1480; Hazeltine I, 444, 450-1, 470). Petitioner says with respect to Heising (brief, pp. 21-2) and with respect to Slepian (brief, p. 25) that respondent's expert testified that both Heising and Slepian disclose automatic volume control. This is not the fact and the references to the record cited by petitioner do not support petitioner's statement. Heising's patent (III, 1272, off'd. I, 235) shows, in a transmitting system dealing with large amounts of energy (Kelley I, 271) and from which *the carrier wave is eliminated* (Hazeltine I, 450), the use of a diode rectifier, but for a purpose quite different from Wheeler's. Not for the purpose of amplification control, but for the purpose of improving the efficiency of the transmitting amplifiers, he develops a rectified potential which is not a steady potential independent of modulation frequency variations as in Wheeler but is a pulsating potential of a frequency twice the frequency of modulation. There is nothing like that in Wheeler (Kelley I, 385-7; Hazeltine I, 450-1). Slepian's patent (III, 1233, off'd. I, 235) discloses a diode rectifier in a very special arrangement of a super-regenerative receiver designed to make the response proportional to the received signal, which is just the opposite condition to that desired in automatic volume control (Hazeltine I, 445). There is no control of amplification or attempt to hold the output constant (Hazeltine I, 448-9; Kelley I, 269). There is nothing in Slepian to point to the use of a diode in automatic volume

control, much less to the diode plus high resistance combination of Wheeler.

Wheeler's System Including a Diode United with a High Resistance was the Product of the Creative, not the Imitative Faculties.

Petitioner's counsel in their brief leave out of discussion the great body of affirmative evidence of invention in the record, which is summarized in Judge Lederle's third conclusion of law (II, 856-8) and is characterized in that conclusion as "evidence showing that what Wheeler did amounted to invention" (and see Opinion of the Sixth Circuit Court of Appeals, III, 1478-9). This evidence will now be briefly reviewed.

The Problem, and the Relevant Publications Prior to Wheeler—For some years prior to Wheeler's invention blasting and fading were well known to be undesirable. They were among the problems constantly confronting the radio engineer and in certain lines of work they were of paramount importance. During the last World War, for example, although there was no broadcasting as we now know it, there was, of course, radio communication and there were phenomena like blasting and fading which would have been solved by an automatic volume control system such as Wheeler's, but, though leading radio scientists from the foremost laboratories in the world were bending every effort to develop satisfactory radio apparatus and though solutions were proposed, they were not like Wheeler's solution and they were not satisfactory for voice reception (MacDonald, II, 615-22).

Shortly after the War, Espenschied & Bown, two prominent engineers of the American Telephone and Tele-

graph Company, devised what appears to be the first automatic volume control system. They were granted patent 1,447,773 in 1923 (III, 915, off'd. I, 501). The system of Espenschied & Bown, however, did not propose to control the amplification by negative biasing voltage, but instead proposed to use a rectified current to control mechanical relays which in turn controlled an electric motor which in turn controlled a potentiometer which varied the fraction of the signal voltage that was fed to the amplifier (Hazeltine, I, 431-3). Later in 1923 Affel, whose later patent 1,574,780, has already been discussed (*ante*, pp. 53-55), was granted patent 1,468,687 (III, 920, off'd. I, 501) for a proposal involving mechanical relays along lines somewhat similar to Espenschied & Bown.

This proposal of the American Telephone and Telegraph Company engineers Espenschied, Bown and Affel to use a rectified current to control the mechanical relays for automatic volume control seems to have been a blind alley. All commercially significant automatic volume control radio receivers have used a negative biasing voltage applied to the grids of the amplifiers to control their amplification.

In 1924 Affel was granted two more patents (1,511,014 and 1,511,015) on circuit arrangements for automatic volume control. In patent 1,511,015 (III, 934, off'd. I, 501) the earlier proposal to use a rectified current to control mechanical relays was abandoned in favor of the use of a rectified potential to control grid bias. Using a triode rectifier he proposed to separate the carrier from the modulation before rectification (Hazeltine I, 434-5). This proposal, subsequently followed by Friis (*ante*, p. 54), was a false lead since it would give a double blast effect and would therefore be ineffective for radio broadcast reception (Hazeltine I, 424-5). In Affel's 1,511,014 patent (III, 927, off'd. I, 501), the carrier is sharply separated

from the modulation (side bands) and later recombined with it in a peculiar detection system. This proposal is quite remote from anything we have to consider (Hazeltime, I, 435-7).

The systems of the Espenschied & Bown patent and the Affel patents are the only published proposals for automatic volume control prior to Wheeler's work late in 1925.

The Genesis of Wheeler's Invention—Wheeler made his invention in the winter of 1925-1926 while taking post-graduate work in physics at Johns Hopkins University and while in the employ of Hazeltine Corporation on part-time development and research work in its laboratory (Wheeler, I, 31, 33, 77-102). That work made him particularly aware of the defect known as blasting (Wheeler, I, 31-2, 57-8) and in the summer of 1925 he set about devising some solution for the difficulty (Wheeler, I, 32, 57; Notebook, III, 891).

The course of his investigations and proposals is set down in his laboratory notebook (Exh. 8, III, 891-912, off'd. I, 146; Wheeler, I, 56-7). These entries constitute a revealing and interesting record of a series of schemes planned, investigated and rejected by Wheeler before he arrived at his final system. It has been well said that the simple way of doing a thing is usually the hardest to arrive at. Nowhere is it better illustrated than here. Not only Wheeler but also many others among the best engineers working in the foremost laboratories of the country (*post*, pp. 68-71) tried to solve the problem by complicated proposals; but Wheeler alone of all those who worked on the problem progressed beyond these proposals to the final simple form.

Wheeler's first thought was to use the modulation frequency potential at the loud speaker to control the ampli-

fication, but he soon realized that this would reduce the amplification during loud passages of music and increase the amplification during soft passages, thus destroying the contrast which should be faithfully preserved. He therefore abandoned that idea and concentrated on developing some scheme which would effect automatic volume control without destroying the musical contrast (Wheeler, I, 57-61, 64-6).

In the receiving sets as they were then built the signal voltage was amplified before detection to a level of the order of something less than one volt, and Wheeler realized that for automatic volume control purposes he would somehow have to get a potential of the order of ten volts (Wheeler, I, 88-9, 96-7). To get this he at first proposed to add a locally generated control-frequency pilot wave which would be amplified with the signal in the carrier-frequency amplifier and after detection might be separated from the rectified signal and further amplified and rectified and used to bias the grids of the carrier-frequency amplifier. This scheme involved the addition to the radio receiver of a pilot-wave generator, an extra amplifier for the pilot-wave frequency, and a separate rectifier. It was too complicated and Wheeler rejected it (Wheeler, I, 72-5).

After rejecting the idea of a pilot wave, Wheeler next investigated the possibility of amplifying the rectified signal voltage in a so-called direct-current amplifier. This proposal did not satisfy Wheeler and it was discarded (Wheeler, I, 74-7; Notebook, III, 895-7). The judgment he exercised was later confirmed by the unsatisfactory commercial use of such schemes by manufacturers (Johnston, II, 561, 566).

Wheeler then proposed taking the amplified carrier-frequency signal potential at the input of the detector (which was much too low for control purposes) and further

amplifying it in a separate carrier-frequency amplifier sufficiently to provide an adequate control potential after rectification (Wheeler, I, 79-82, 88-90; Notebook, III, 899-901). This scheme was proposed for use in a superheterodyne receiver in which the incoming carrier frequency had been changed to a lower carrier frequency, called the intermediate frequency (Wheeler, I, 84). It took three different forms (Wheeler, I, 90). These arrangements still had the disadvantage of using separate amplifiers and (triode) rectifiers for the development of the control potential (Wheeler, I, 82, 93).

Wheeler then decided to depart from the then accepted practice of amplifying the carrier-frequency signal only to a low level, sufficient for signal detection but inadequate for control purposes, and instead to amplify the carrier-frequency signal to a sufficiently high level for control purposes prior to detection so that the rectified potential in the output circuit of the detector would be high enough for automatic volume control purposes without any further amplification (Wheeler, I, 83-5, 88-9, 92). By this step the need for a separate amplifier and a separate control-potential rectifier was eliminated (Wheeler, I, 84).

In all of the arrangements proposed by Wheeler up to this point he had used for rectification and detection the three-electrode rectifier (Wheeler, I, 93), which by that time, 1925, had superseded all other forms of radio signal rectifiers and detectors, principally because it not only performed the function of detection but also gave a significant amount of additional amplification (Wheeler, I, 94; Hazeltine, I, 462; Kelley, I, 331, 372-3; Cotter, II, 551, 555-6; Johnston, II, 558; Curtis, II, 574; Farrand, II, 595-6).

Although Wheeler recognized that the use of the triode rectifier for automatic volume control necessarily involved

the use of separate batteries and foresaw that the relation between the C battery voltage and the B battery voltage would be critical and would call for frequent adjustment by the user, it was at the time the universally employed signal detector and he proceeded to put down in his notebook a complete receiver circuit diagram including the triode rectifier with its associated batteries and a potentiometer operable by the user of the set to adjust the C battery voltage, and proceeded to make definite plans for constructing such a receiver and to this end designed in detail its typical units, calculating the potential values at different points of the receiver, and so on (Wheeler, I, 85-6, 87-8, 90, 93; Notebook, III, 902-4).

On December 17, 1925, two days before Wheeler left Johns Hopkins University for the Christmas holidays in Washington, D. C., he took the final step that reached the full conception of his diode system of automatic volume control. On that day he entered on page 89 of his notebook under the heading "Separate Rectifier Tube for Control" a full disclosure of a diode rectifier with a high resistance (high in relation to the internal resistance of the diode) connected between its cathode and anode, adequate to produce directly from the signal itself the high-level direct-current biasing potential (ten volts) that he required for his automatic volume control (Wheeler, I, 93-8; Notebook, III, 905). So completely had the diode passed from use as a signal detector that Wheeler proposed to transform the commonly used triode detector into a diode by connecting together two of the three electrodes in the triode (Wheeler, I, 94-5). The diagram in the middle of this notebook page 89 shows this diode connected in Wheeler's automatic volume control system, and the high resistance is indicated as having a value of 10^6 (1,000,000) ohms (Notebook, III,

905), which was of the order of 100 times the internal resistance of the diode (Hazeltine, I, 202) and the entries show that he expected to derive from the amplified signal itself a control voltage of ten volts which could be applied to the amplifier grids for automatic volume control (Wheeler, I, 96-7).

On December 19, 1925, Wheeler went from Johns Hopkins to his home in Washington to spend the Christmas holidays, and there, in the period from December 19, 1925 to January 1, 1926, he constructed a radio receiving set using his triode system of automatic volume control (Wheeler, I, 77-100). Wheeler originally set the receiver up with a triode rectifier having an A battery for heating the filament, a B battery for supplying to the plate circuit the current out of which the control potential was to be created and a C battery provided with a potentiometer for adjusting the grid bias of the rectifier to balance the characteristics of the particular rectifier tube employed against the varying characteristics of the A battery and B battery (Notebook, III, 904; Wheeler, I, 85-6, 87-8, 91, 93, 100). The receiver worked all right as an ordinary radio receiver, but when Wheeler came to operate the automatic volume control, he got into trouble.

He finally decided to substitute for the triode rectifier, the circuit including a diode united with a high resistance which he had devised and recorded in his notebook on page 89 (Wheeler, I, 100-1). After this change, the operation of the automatic volume control system was immediately successful; and this successful reduction to practice of the invention was demonstrated to a number of Wheeler's friends on January 3, 1926 (Wheeler, I, 102, 108-10, 116, 119).

It is appropriate for us to mention here the fact that quite apart from his independent contribution of his new

arrangement of diode rectifier united with a high resistance with its new result, Wheeler in his work had followed a course which avoided the blind alleys and false leads into which he might have been led by the mere acceptance of what had then been published by others on the subject of automatic volume control. He did not spend any time on the use of a rectified current to control mechanical relays as Espenschied & Bown had proposed. He did not separate the carrier from the modulation before rectification as Affel and Friis had proposed—a proposal that would have been fatal in a radio broadcast receiver where the set must be tuned from station to station.

The actual apparatus which Wheeler built and which was demonstrated on January 3, 1926, has been preserved and was produced at the trial (Wheeler, I, 102; Exh. 19, off'd. I, 35; also see Exhs. 20-23, III, 990-3, off'd. I, 107).

The next demonstration was made to Mr. John F. Dreyer, Jr., an engineer employed in the laboratories of Hazeltine Corporation, then located at Hoboken, N. J. This demonstration also was at Wheeler's home in Washington and took place in April 1926. Wheeler had urged Dreyer to come to Washington sooner, but Dreyer was unable to do so (Wheeler, I, 119-21; Dreyer, II, 638g). Immediately after the demonstration Mr. Dreyer reported to the officers of the Company stating that he was very much impressed by the operation of Wheeler's device and believed it would be advisable to submit it to the licensees of Hazeltine Corporation (Dreyer, II, 638g-638h; Exh. 25, III, 996, off'd. I, 122).

Wheeler Led the Industry to the Adoption of Automatic Volume Control—Soon after Dreyer's report an actual commercial type of receiver then in production by one of Hazeltine Corporation's licensees was modified so as to

embody Wheeler's automatic volume control invention including the diode united with a high resistance. This was done under Wheeler's direction at the factory of the Stromberg-Carlson Telephone Manufacturing Company at Rochester, N. Y. (Wheeler, I, 124; Graham, II, 512; Levy, II, 533-5; Exh. 14, off'd. I, 35; and see Exhs. 14A, 14B and 15, III, 977-9, off'd. I, 124-5). This receiver was shipped to the Hazeltine laboratories in Hoboken and there tested and successfully operated and demonstrated in August, 1926 (Wheeler, I, 126-7; Graham, II, 514-16; Levy, II, 535-6). It was not put into production by the Stromberg-Carlson Company (Wheeler, I, 130).

Shortly thereafter Wheeler disclosed his automatic volume control to the engineers of the various companies who were Hazeltine licensees at one of their regular engineering meetings on August 19, 1926 in New York City (Wheeler, I, 127-9; Graham, II, 514-16; Exh. 13, III, 975, off'd. I, 128). None of the manufacturers to whom the invention was disclosed did anything with reference to commercializing it until the Fall of 1927 when the Howard Radio Company at Chicago brought out a receiver using the Wheeler system. This receiver was designed by Mr. Wheeler himself in the Summer of 1927 working at the Howard factory. It was an unusually elaborate receiver in every respect and was housed in an expensive cabinet. It was priced at several thousand dollars and only six of them were ever built (Wheeler, I, 130-2).

Soon after designing this receiver for the Howard Radio Company Wheeler disclosed the invention to the engineers of the radio industry generally at a meeting of the Institute of Radio Engineers held in New York in November of 1927 (Wheeler, I, 132-3). His disclosure was published in the Proceedings of the Institute in January of 1928 (Exh. 17, III, 984-8, off'd. I, 133); and it appears that

to the practical engineers who testified at the trial this was the first information they had on the subject of automatic volume control of any kind (Cotter II, 551-3; Curtis II, 573-4; Dunn II, 584-5; Farrand II, 596; Earnshaw II, 604).

Shortly thereafter in the Fall of 1928, the Radio Corporation of America brought out a receiver known as the Radiola 64 using a system of automatic volume control designed by engineers of the General Electric and Westinghouse Companies. This automatic volume control system used by the Radio Corporation of America differed from the Wheeler system, however, in that it utilized a three-electrode rectifier for control purposes, whereas Wheeler proposed to use the diode rectifier united with a high resistance which he had created. This Radiola 64 model was discontinued after 1929 and the following year the Radio Corporation of America did not incorporate any automatic volume control in its receivers (Wheeler, I, 133-5, 169-70).

Finally in 1929 the Philadelphia Storage Battery Company, manufacturers of the well known Philco radio receivers, incorporated the Wheeler system of automatic volume control in a receiver made in substantial quantities and it was this receiver which finally marked the commercial success of automatic volume control (Wheeler, I, 139). The receiver was the Philco Model 95 designed by Wheeler (Wheeler, I, 135; Exh. 18, III, 989, off'd. I, 136). The receiver was priced considerably higher than most receivers of the time but was unusually successful because its operation, due to the use of the Wheeler automatic volume control system, was so different from that of other contemporaneous receivers (Earnshaw, II, 605-7; MacDonald, II, 632). The thing which distinguished its operation was that the automatic volume control system would tend to counteract fading and maintain the sound volume at a constant level and would eliminate blasting so that when tuning

from one station to another the user would not be troubled with the tremendous volume of the local stations; all signals would closely maintain the level chosen by the user in initially setting his manual control knob. The commercial success of this receiver was attributed by the Company to the satisfactory operation of the automatic volume control system; and the Wheeler diode system was therefore continued in Philco receivers (Earnshaw, II, 607-8). Up to the time that Mr. Earnshaw, their chief engineer, gave the evidence which was introduced in this case, Philco had sold over 4,000,000 receivers utilizing the Wheeler system of automatic volume control (Earnshaw, II, 605).

The Radio Industry at First Rejected, but Finally Adopted, the Wheeler Diode System—Even after the success of the Philco receiver the radio industry as a whole was unwilling to adopt Wheeler's system. So strong was their prejudice against the long outmoded diode detector that they thought that Wheeler in creating a system which employed it had taken a backward step (Hazeltine, I, 469) and also thought that the correct path lay along the line of using the established and universally employed three-electrode vacuum tube as a detector. The industry therefore generally adopted the triode system of automatic volume control which was advised by other leading engineers and research workers; but finally, after years of great difficulties with the triode system, the industry abandoned it and overcame its difficulties by adopting the simpler yet more effective Wheeler diode system.

The testimony of the practical engineers was that they either adopted the Wheeler system in the first place with unqualified and uniform success or they rejected the Wheeler system and adopted the triode system on their own initiative or on the advice of other engineers with re-

solving difficulties so inherently tied up with the triode rectifier as to lead to the abandonment of the triode automatic volume control system and the adoption of the Wheeler diode system.¹

At the present time not only the petitioner but the entire industry uses the Wheeler diode system in preference to all others and this includes the Radio Corporation of America which owns or controls the patents on the other automatic volume control systems which petitioner relies on in this case (Finding 18, II, 853; C. C. A. 6 Opinion, III, 1471; Wheeler, I, 139-41; Exh. 7, III, 890, off'd. I, 143).

The shift of the manufacturers from the various triode systems to the Wheeler diode system as the engineers gradually overcame their prejudice against the diode system and came to understand the defects and limitations of the triode system is graphically shown in the chart, Exhibit 7 (III, 890, off'd. I, 143). It shows that the majority of the designing engineers followed their prejudice in choosing at first the triode form in preference to the diode and that this state of affairs continued until 1931. By the year 1932, however, the Wheeler diode system became appreciated to such an extent that its use far exceeded the triode system and since that year the use of the other systems has declined to a negligible amount and the Wheeler diode system has been universally adopted (Wheeler, I, 139-43, 168-70).²

¹ See Graham, II, 517-20; Cotter, II, 553; Johnston, II, 560-2, 568; Curtis, II, 575-7; Dunn, II, 585-7; Farrand, II, 597-9; Earnshaw, II, 605, 607-8; Wheeler, I, 143, 170.

² Petitioner attempts to reduce the force of this strong evidence of invention by suggesting (brief, pp. 31-2) that the reason why Wheeler's diode system was at first rejected was that amplification was not available adequate to permit use of the diode and says that the Wheeler system was of no practical utility "until the advent in 1929 of the screened grid tube with the additional amplification which

The success of the Wheeler automatic volume control was particularly striking in the case of automobile radio, which presented a peculiar problem making some form of automatic volume control an absolute necessity. About 1929 a company known as the Transitone Automobile Radio Corporation had been trying to market an automobile receiver, but unsuccessfully, because the automobile necessarily moved around under bridges and beside buildings and generally into different environments which made the strength of the signal vary up and down as in ordinary fading, so it was impossible to get the public to favor automobile receivers. The Philadelphia Storage Battery Company (Philco) acquired the Transitone Automobile Radio Corporation and a new receiver for automobiles was designed using Wheeler's diode system of automatic volume control. It was immediately successful, and every automobile receiver produced by Philco since that time has used Wheeler's diode automatic volume control (Earnshaw, II, 608-9; Wheeler, I, 138-9).

Others Who Contemporaneously Worked on the Problem of Automatic Volume Control Failed to Arrive at Wheeler's Solution—We have already been introduced to the work on automatic volume control that went on in the research laboratories of the American Telephone & Telegraph Company and of the Western Electric Company,

it provided". The facts are to the contrary. The amplification available prior to 1929 when the screen grid tube was introduced was in fact adequate for Wheeler's system and the amount available was not materially altered by the introduction of the screen grid tube (Hazeltine, I, 460-1; Wheeler, I, 134, 496-7) and the art continued to reject Wheeler's system for failure to appreciate its value until 1932, which was three years after the advent of the screen grid tube (see chart, Exh. 7, III, 890, off'd. I, 143).

one of the associates of the American Telephone & Telegraph system. This included the proposals of Affel, published in his patents of 1923, 1924 and 1926 and the then unpublished work of Friis and of Evans which antedated Wheeler's invention (*ante*, pp. 47-55). Another Affel patent 1,677,224 issued in July of 1928 (III, 948, off'd. I, 501) which showed still another triode proposal (Hazeltine, I, 437-9). Ohl of the American Telephone & Telegraph Company took out patent 1,772,517 in August 1930 (III, 945, off'd. I, 501) which was directed particularly to correcting the defect of regeneration in the system of Affel patent 1,511,015. Ohl retained and accentuated the double blast defect (Hazeltine, I, 439-40). And Bruce, an engineer of the Bell Telephone Laboratories which is another associate of the American Telephone & Telegraph system, took out patent 1,778,750 in October of 1930 (III, 957, off'd. I, 501) which shows another form of triode system subject to the usual defects (Hazeltine, I, 442).

Work on this problem of automatic volume control was not, however, confined during this period to Wheeler and to the engineers of the American Telephone & Telegraph Company and its associates. Additionally there was Falknor of the Westinghouse Electric and Manufacturing Company, whose patent 1,698,014 of January 1929 (III, 941, off'd. I, 501) shows an intricate and complicated system employing triodes, as did the others, and using two antennas (Hazeltine, I, 440-1); DeBellescize, a French engineer who assigned his application to the Radio Corporation of America and whose patent 1,867,139, issued in July of 1932 (III, 951, off'd. I, 501), shows a system in which a mechanical relay is used (Hazeltine I, 441-2); Simonds of the General Electric Company, whose patent 1,914,219 of June 1933 (III, 962, off'd. I, 501) shows another form of

triode system (Hazeltine, I, 442-3); and Carter of General Electric Company, whose patent 1,739,351 of December 1929 (III, 968, off'd. I, 501) shows still another form of triode system (Hazeltine, I, 443-4).

The respect for Wheeler's creative step would be much increased by a detailed technical consideration and understanding of the various solutions proposed and patented by these other workers, but we can afford to omit a technical discussion of them inasmuch as the ultimate facts to be established thereby are clear, namely that there were many such workers, that they worked over a substantial period of time, that they were well qualified, that they worked in the foremost laboratories of the country, that they arrived at solutions which were believed by them to be effective and which were patented by them but which nonetheless were found in practice to be inferior to the Wheeler system, and that not one of these workers ever suggested that the control potential for automatic volume control might be derived directly from the amplified signal by increasing the amplification of that signal, impressing it upon a diode rectifier and associating with the diode rectifier a high external resistance to give linear response.

A fair idea of the attitude of the skilled engineer of the time can be gained from considering that when the Bell Telephone Laboratories in the latter part of 1925 (Scarr, II, 805-6) commissioned its engineers to build the best broadcast receiver that could be built (Betts, II, 719) and it was decided to include a system of automatic volume control, these engineers thought of nothing better than a triode system and struggled with many variations of the circuits trying to rid that system of the extra batteries (Betts, II, 720, 731; Scarr, II, 829-30, 835). This is the so-called "Actual construction and use by the Western Electric Company of the Friis arrangement" asserted by peti-

tioner's counsel¹ (brief p. 24). But the evidence is that the operation of the system was defective because the triode rectifier was critical and because they adopted the Friis proposal wherein he sharply selected the carrier for control purposes (Scarr, II, 308, 825-6) with the result that the receiver gave two blasts instead of one (Hazeltine, I, 424-5).

It was on this evidence which we have summarized on the foregoing pages 56 to 71 that Judge Lederle made his Findings 5 to 18 inclusive (II, 847-53) and 22 (II, 855) and concluded that Wheeler's diode system "is an invention and is patentable" (Conclusion 2, II, 856) and that (Conclusion 3, II, 856-8):

"The fact that the Wheeler system of automatic volume control is different from any other system of automatic volume control, the fact that the diode used by Wheeler had not been in use in radio receivers for many years and previously had been rejected in favor of the triode, the fact that the diode had to be modified to accomplish Wheeler's purpose by operating it at a high potential and connecting a high resistance across its electrodes, the fact that the

¹ At page 24 petitioner's counsel go on to a still more reckless assertion. They say:

"Moreover in the structure built by Friis, he used a high resistance and obtained linear rectification (III, 1392). This fact was overlooked by the court below, which erroneously held to the contrary (III, 1480)."

Page 1392 of the record is the first page of a memorandum of April 14, 1924 which was offered in evidence at page 656. It does not contain the assertion that Friis obtained linear rectification and therefore wholly fails to support petitioner's assertion, quite apart from any question about the competency of such a memorandum to prove such a fact. Mr. Friis testified that the external resistance was not higher than that of the tube (II, 661, XQs. 146-149), and that he did not get a linear effect (II, 665, XQ. 172).

diode after modification gave a new and improved result, the fact that other engineers and scientists working on the problem did not arrive at Wheeler's solution, the fact that the systems devised by others had defects that made them less satisfactory than Wheeler's, the fact that these other systems were devised by engineers in the foremost engineering and research groups, the fact that practicing engineers skilled in the art of radio receiver manufacture did not know of any successful automatic volume control system at the time of Wheeler's invention in December, 1925, the fact that Wheeler's system was at first regarded as a backward step by other engineers and manufacturers and later proved to be the best system, the fact that engineering laboratories and engineers at first recommended and manufacturers at first preferred to use other systems but finally adopted the Wheeler system after the others were found unsatisfactory, the fact that practically all receivers today that use any form of automatic volume control use the Wheeler system, the fact that the Wheeler system has gradually supplanted all others, the fact that defendant is licensed to use the other systems that were devised and nonetheless prefer the Wheeler system, the fact that the majority of other manufacturers are licensed to use the other systems that were devised but nonetheless prefer to use the Wheeler system, all constitute evidence showing that what Wheeler did amounted to invention.

'A new combination of elements old in themselves but which produce a new and useful result, or any diversity of arrangement of old things which introduces a new function, or a new and useful method of performing the old function in a new way supports patentability.' *Forestek Plating etc. Co. v. Knapp Monarch Company*, (C. C. A. 6) 106 F. (2d) 554, 557.

Also see: *Bingham Company v. Ware* (C. C. A. 6) 46 F. (2d) 33; *France Manufacturing Company v. Jefferson Electric Company* (C. C. A. 6) 106 F. (2d) 605; *Cleveland Trust Company v. Schriber-Schroth* (C. C. A. 6) 92 F. (2d) 330; *National Battery Company v. Richardson Company* (C. C. A. 6) 63 F. (2d) 289; *Diamond Rubber Company v. Consolidated Tire Company*, 220 U. S. 428."¹

Infringement.

The discussion of infringement in petitioner's brief comes to the conclusion that petitioner's accused receivers employ "the *identical* circuit arrangement that is employed in prior patents" (emphasis theirs), and that this identity "may be clearly seen by simple comparison" with the "prior Evans and Slepian patents" (brief, p. 30). The disclosure of the Slepian patent is really quite unrelated to the subject of automatic volume control (see *ante*, p. 55) and has assumed no important value throughout this litigation. As we have already pointed out (*ante*, p. 47), everyone agrees that the Evans patents are the closest approximation to the Wheeler system. That petitioner's accused receivers follow the teachings of the Wheeler patent beyond the teachings of the Evans patents was held by the trial court (Finding 23, II, 855) and affirmed by the Court of Appeals. The Court of Appeals said (III, 1480):

"Appellant [petitioner] contends that its device is patterned after Evans and the other above-men-

¹ See further *Expanded Metal Co. v. Bradford*, 214 U. S. 366, 381; *Seymour v. Osborne*, 11 Wall. 516, 548; *Loom Co. v. Higgins*, 105 U. S. 580, 591; *Krementz v. S. Cottle Co.*, 148 U. S. 556, 559; *Potts v. Creager*, 155 U. S. 597, 608; *Carnegie v. Cambria*, 185 U. S. 403, 446; *Temco Co. v. Apco Co.*, 275 U. S. 319, 326-7.

tioned patents; but there is no merit in this contention. While appellant [petitioner] uses a multi-purpose tube which contains a diode and triode, it concedes that it employs the diode only for the purpose of automatic volume control. It secures its energy just as Wheeler, from the amplified signal itself, and uses a high resistance through which it develops the linear characteristic with the resulting control voltage which is directly proportional to the amplified signal voltage. These features are the gist of the Wheeler invention, and appellant [petitioner] has paid the compliment of adopting them. As held by the District Court, appellant's [petitioner's] receivers embody the invention disclosed in the reissue patent."

No other conclusion was possible on the evidence given at the trial, because petitioner's expert Kelley frankly admitted (I, 321) that in the petitioner's system, "the control potential is created from the amplified signal itself without the interposition of any extraneous electromotive force at all"; that in that respect petitioner's system corresponds "to the system shown in the Wheeler patent rather than to the system shown in the Evans drawing", and that in both Wheeler and in petitioner's system "the controlling potential is created by passing the energy of the amplified signal through a two-electrode detector which has properly connected to its circuit this high resistance 51, sufficiently high so that that energy produces the desired potential at the control grid", although the circuit in which the high resistance is included is specifically different in the two cases (I, 321). And he agreed "that a diode detector used in series with a high resistance as in the Wheeler patent and as in the defendant's [petitioner's] sets, will give linear detection", and that in the Wheeler system and in the petitioner's sets the result is "that the energy of the signal

itself is caused to create a potential for control and that potential is maintained directly proportional to the energy of the amplified signal itself" (I, 328-9).

When petitioner's counsel, referring to the accused receivers, say (brief, p. 26) "neither of which, concededly, employs Wheeler's a.a.c. circuit (Hazeltine, I, 474)"; and (p. 28) that petitioner's expert Kelley testified (I, 287) and respondent's expert Hazeltine admitted (I, 473) "that the automatic amplification circuit of the Detrola receivers is different from that of the patent" counsel have reference not to any difference in connection that affects automatic volume control, but to details of electrical connections determined by quite trivial considerations, viz., the desirability in radio broadcast receiver design of grounding the tuning condenser; considerations which arose before and apart from any matter of automatic volume control and were satisfied by these known analogous alternative connections years prior to Wheeler (Hazeltine, I, 456).

Petitioner's counsel say (brief, p. 27) that by improvements in the physical construction of radio tubes it "became possible to combine the functions of several tubes in a single glass envelope" and that in petitioner's sets the two electrodes which constitute the diode are enclosed within the same glass envelope with three other electrodes which serve other functions. It seems clear enough that petitioner does not avoid infringement by this use of improved radio tubes, since the tubes admittedly contain the two electrodes which constitute the diode of Wheeler's patented arrangement. In fact, these multi-purpose tubes were brought out and marketed for the very purpose of making use of Wheeler's invention (Wheeler, I, 144-6). A further and equally trivial suggestion of non-infringement is that the high resistance is not "connected between" the rectifier anode and the amplifier cathode, as specified in some of the claims

(brief, p. 27). But on counsel's own showing (p. 28) the high resistance in the accused receivers is connected between the rectifier anode and the amplifier cathode. Counsel merely point out that an oscillation circuit is included in the same connection. Counsel do not pretend to support this strained literalism by any suggestion that the inclusion of the additional element in the same connection with the high resistance, or the inclusion of the diode electrodes in the same glass envelope with other electrodes, affects at all the functional operation to bring about any departure from the patented system.

Alleged Intervening Rights

Petitioner claims intervening rights in that its accused receiving sets are identical in every material respect with the receivers manufactured by petitioner prior to the application for the reissue patent, as well as with certain Colonial receivers held not to infringe the original patent (brief p. 52).¹

Counsel rely upon the recent decision of this Court in the *Sontag*² case.

But the Wheeler reissue patent now at bar is a *narrowing* reissue granted to cure a deficiency in the original patent arising from the fact that the original patent inad-

¹ The Colonial receivers were held not to infringe the original Wheeler patent in *Hazeltine Corp'n v. R. E. B. Service Corp'n.*, 8 F. Supp. 100, D. C. E. D. N. Y. That decision was rendered after Judge Galston had held the patent invalid in the *Abrams* case. The defendant, R. E. B. Service Corp'n., was estopped to assert invalidity so that Judge Campbell's decision was limited to the question of infringement.

² *Sontag Chain Stores v. National Nut Co. of California*, 310 U. S. 281.

vertently claimed *more* than the inventor had a right to claim as new (see *ante*, pp. 14-16). The doctrine of equitable estoppel applied by this Court in the *Sontag* case is applicable by its very nature only to *broadening* reissues.¹ The broadening of the scope of the monopoly by the reissue is the indispensable fact out of which the intervening rights arise. It is the issuance of the original patent with narrow claims, of less scope than the broadened claims of the reissue, that constitutes the basis of the equitable estoppel upon which the decision in the *Sontag* case was predicated.²

Petitioner lays undue emphasis on a case in the Eastern District of New York in which a radio receiving set similar to petitioner's accused sets was held not to infringe the original patent (*Hazeltine Corp'n. v. R.E.B. Service Corp.*, 8 F. Supp. 100). It is true that respondent, for reasons sufficient to it, did not appeal from that judgment. Since there is no suggestion of privity between that defendant and this petitioner, the situation is not one of *res adjudicata* or estoppel. The statement of petitioner's counsel (brief p. 53) that "Plaintiff acquiesced in that judgment and never appealed therefrom", has no legal significance in the present case.

It may be added (putting aside for the moment the fact that the doctrine does not apply at all to narrowed reissues) that the manufacture of the accused type of receiving sets

¹ *Abercrombie & Fitch Co. v. Baldwin*, 245 U. S. 198, 209-10; *Ball & Roller Bearing Co. v. F. C. Sanford Mfg. Co.*, (C. C. A. 2) 297 Fed. 163, 165; *Supreme Mfg. Co. v. Security Mfg. Co.*, (C. C. A. 9) 299 Fed. 65, 68; *Babcock & Wilcox Co. v. Springfield Boiler Co.* (C. C. A. 2) 16 F. (2d) 964, 970; *Kansas City, etc. Co. v. Silica Products Co.* (C. C. A. 8) 48 F. (2d) 503, 508; *Wire Tie Machine Co. v. Pacific Box Corp.* (C. C. A. 9) 102 F. (2d) 543, 559; *General Electric Co. v. Munder Electrical Co.* (D. C. D. Mass.) 22 F. Supp. 291, 296.

² See *Sontag* case, 310 U. S. 281 at pages 290 and 291.

by petitioner began and was renewed *before* the original Wheeler patent issued in September 1932 (in 1931, II, 215 and in August, 1932, II, 213). Petitioner did not therefore enter upon the manufacture relying upon any "just reason to suppose that the field of action was open", derived from the specification and claims of the original patent; or shape its course of manufacture in reliance upon the scope of that patent. Petitioner was not, by any act or omission of the appellee, given to understand that it might rightfully use the Wheeler automatic volume control system.¹ On the contrary, petitioner's accused apparatus has been held to infringe three claims of the reissue patent, which were not changed from their original form, viz., claims 2, 3 and 5 of the reissue which are identical respectively with claims 2, 3 and 11 of the original patent (Conclusions of Law 1, II, 856 and 5, 858). And, although petitioner continued to manufacture the accused type of receiving sets up to the present time, there is not the slightest evidence in the record that the decision of the District Court for the Eastern District of New York in the *R.E.B.* case had any effect whatever upon petitioner's continuation of this manufacture.

We submit that this Court should affirm the conclusion of the Sixth Circuit Court of Appeals, expressed as follows (III, 1476):

"As Wheeler's reissue was a narrowing, instead of a broadening reissue, the doctrine of equitable estoppel declared in *Sontag Chain Stores Co., Ltd., v. National Nut Co.*, 310 U. S. 281, does not apply."

¹ See *Sontag* case, 310 U. S. 281, at page 293.

Conclusion as to Petitioner's Points I, II and IV.

We respectfully submit, as to these points:

1. That they present no conflict for determination by this Court and should for this reason be dismissed;
2. That if this Court nonetheless chooses to consider them then the decision of the Sixth Circuit Court of Appeals should be affirmed as to each point for the reasons stated.

Conclusion.

It is submitted that, unless this Court dismisses the writ, the decision of the Sixth Circuit Court of Appeals should be affirmed.

Respectfully submitted,

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Of Counsel:

GEORGE E. FAITHFULL

W. PETERS BLANC

March 29, 1941.

Appendix.

R. S., SEC. 4916. (U. S. C., Title 35, Sec. 64.) Whenever any patent is wholly or partly inoperative or invalid, by reason of a defective or insufficient specification, or by reason of the patentee claiming as his own invention or discovery more than he had a right to claim as new, if the error has arisen by inadvertence, accident, or mistake, and without any fraudulent or deceptive intention, the commissioner shall, on the surrender of such patent and the payment of the duty required by law, cause a patent for the same invention, and in accordance with the corrected specification, to be reissued to the patentee or to his assigns or legal representatives, for the unexpired part of the term of the original patent. Such surrender shall take effect upon the issue of the reissued patent, but in so far as the claims of the original and reissued patents are identical, such surrender shall not affect any action then pending nor abate any cause of action then existing, and the reissued patent to the extent that its claims are identical with the original patent shall constitute a continuation thereof and have effect continuously from the date of the original patent. The commissioner may, in his discretion, cause several patents to be issued for distinct and separate parts of the thing patented, upon demand of the applicant, and upon payment of the required fee for a reissue for each of such reissued letters patent. The specifications and claims in every such case shall be subject to revision and restriction in the same manner as original applications are. Every patent so reissued, together with the corrected specifications, shall have the same effect and operation in law, on the trial of all actions for causes thereafter arising, as if the same had been originally filed in such corrected form; but no new matter shall be introduced into the specification, nor in the case of a machine patent shall the model or drawings be amended, except each by the other; but when there is neither model nor drawing, amendments may be

made upon proof satisfactory to the commissioner that such new matter or amendment was a part of the original invention, and was omitted from the specification by inadvertence, accident, or mistake, as aforesaid.

R. S., SEC. 4917. (U. S. C., Title 35, Sec. 65.) Whenever, through inadvertence, accident, or mistake, and without any fraudulent or deceptive intention, a patentee has claimed more than that of which he was the original or first inventor or discoverer, his patent shall be valid for all that part which is truly and justly his own, provided the same is a material or substantial part of the thing patented; and any such patentee, his heirs or assigns, whether of the whole or any sectional interest therein, may, on payment of the fee required by law, make disclaimer of such parts of the thing patented as he shall not choose to claim or to hold by virtue of the patent or assignment, stating therein the extent of his interest in such patent. Such disclaimer shall be in writing, attested by one or more witnesses, and recorded in the Patent Office; and it shall thereafter be considered as part of the original specification to the extent of the interest possessed by the claimant and by those claiming under him after the record thereof. But no such disclaimer shall affect any action pending at the time of its being filed, except so far as may relate to the question of unreasonable neglect or delay in filing it.

R. S., SEC. 4922. (U. S. C., Title 35, Sec. 71.) Whenever, through inadvertence, accident, or mistake, and without any willful default or intent to defraud or mislead the public, a patentee has, in his specification, claimed to be the original and first inventor or discoverer of any material or substantial part of the thing patented, of which he was not the original and first inventor or discoverer, every such patentee, his executors, administrators, and assigns, whether of the whole or any sectional interest in the patent, may maintain a suit at law or in equity, for the infringement of any part thereof, which was bona fide his

own, if it is a material and substantial part of the thing patented, and definitely distinguishable from the parts claimed without right, notwithstanding the specifications may embrace more than that of which the patentee was the first inventor or discoverer. But in every such case in which a judgment or decree shall be rendered for the plaintiff no costs shall be recovered unless the proper disclaimer has been entered at the Patent Office before the commencement of the suit. But no patentee shall be entitled to the benefits of this section if he has unreasonably neglected or delayed to enter a disclaimer.

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SUPREME COURT OF THE UNITED STATES.

No. 666.—OCTOBER TERM, 1940.

Detrola Radio and Television Cor- poration, Petitioner, <i>vs.</i> Hazeltine Corporation.	}	On Writ of Certiorari to the United States Circuit Court of Appeals for the Sixth Circuit.
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[May 12, 1941.]

Mr. Justice ROBERTS delivered the opinion of the Court.

July 7, 1927, Harold A. Wheeler applied for a patent for a circuit designed automatically to control the amplitude of amplified signal voltage in modulated carrier-current signalling systems. Patent No. 1,879,863 issued September 27, 1932, to the respondent as assignee of Wheeler.

A suit was brought in the Eastern District of New York for infringement of Claims 1, 5, 6, and 10.¹ The District Court held the claims invalid for want of invention. The Circuit Court of Appeals for the Second Circuit affirmed the decree.²

September 26, 1935, while the appeal to the Circuit Court of Appeals was pending, respondent applied for a reissue. After the decision of the Circuit Court of Appeals respondent redrafted the claims and, October 29, 1935, a reissue patent, No. 19,744, was granted. The present suit was thereafter instituted against the petitioner for infringement of all the thirteen claims of the reissue except Claim 9. The District Court held the patent valid and infringed and its decree was affirmed by the Circuit Court of Appeals.³ The petition for certiorari presented, *inter alia*, the question whether the decision conflicts with that of the Second Circuit.

Control of the amplification of a modulated carrier-wave signal is useful in connection with transmitting and receiving apparatus and, in the original patent, Wheeler claimed his system as respects both. In his specifications, however, he confined himself to its ap-

¹ Hazeltine v. Abrams, 7 F. Supp. 908.

² Hazeltine v. Abrams, 79 F. (2d) 329.

³ Detrola Radio and Television Corporation v. Hazeltine Corporation, 117 F. (2d) 238.

2 *Detrola Radio and Television Corp. vs. Hazeltine Corp.*

plication to receivers, wherein its function is to control the volume of sound emitted from the loud speaker. In broadcasting, a high frequency wave, known as a carrier wave, is impressed with another low frequency wave or, as it is said, modulated. The high frequency, or signal, wave is picked up by the antenna of a receiver and conducted thence to the input of an amplifying device which consists of an amplifier tube, or several of them in series. These tubes have three electrodes, a cathode, an anode, and a grid, and are called triodes. The signal wave, as amplified, is carried from the output of the amplifying device to the input of a vacuum tube, known as a detector or rectifier, which transmutes the alternating current into a unidirectional or direct pulsating current. This is led to audio tubes which enhance its volume, and thence to a loud speaker. Such a receiving set has other equipment for selecting signals of varying frequency and adjusting the amplification of the audio waves, with which we need not concern ourselves.

One of the problems of the art has arisen from variations of the received signals. When the set is tuned from a weak signal to a much stronger one the tendency is for potential to build up in the last amplifying tube, which results in what is known as blasting in the loud speaker. Often the same signal varies in intensity. Weakening may result in fading, whereby the sound production weakens or disappears; and strengthening may beget distortion of the sounds emitted.

Wheeler essayed to obviate these objectionable features. It was known that the amplification of the carrier signal could be controlled by increasing or decreasing the potential upon the grid of a triode amplifier. Wheeler proposed automatically to vary this potential so as to increase or decrease the degree of amplification and thus hold it at a substantially predetermined level. To this end he provided means to increase the negative potential upon the anode of the detector tube in step with the increased strength of the signal and to conduct a direct current from that anode to the grid electrode of one or more of the amplifying tubes. Thus an increase of the strength of the signal would automatically increase the negative potential on the grid of the amplifier and decrease the amplification; the reverse result would be effected if the signal weakened. The means he adopted to accomplish this were alternative.

According to one method the signal was amplified to a comparatively high voltage, and a diode used as a detector. The output voltage from the detector was approximately as great as that of the amplified signal. By coupling the cathode and anode of the detector and inserting a resistance in the coupling he could maintain the anode of the detector slightly negative at all times. Since he connected all the cathodes in parallel the cathode of the detector was maintained at substantially the same potential as the cathode of the radio frequency amplifier. By this means the anode of the detector could be maintained normally negative relative to at least a part of the amplifier cathode. When the rectified current flowing through the detector circuit increased with the strength of the signal there was developed at the output terminal of the detector circuit, through the operation of the resistance, which was also connected between the anode of the detector and the grid of the amplifier, an increase of negative voltage which, through the direct current connection from the terminal of the detector circuit to the grid of the amplifier, increased the negative potential thereof, and lessened the signal amplification. Conversely, if the strength of the signal current decreased, the negative potential developed upon the anode of the detector correspondingly decreased and there was a decreased inhibition of the amplifying power of the signal amplifier.

In his alternative method, he accomplished the same result with a triode detector. In this arrangement he maintained a negative voltage on the grid of the detector triode by the use of a battery and a potentiometer connected across the cathode of the detector tube. The output circuit of the detector included a resistance connected between the anode of the detector and the common "B" battery of a radio set. A direct connection was provided from the output terminal of this circuit to the grid of the signal amplifier for impressing thereon the potential developed on the anode of the detector. The amplified signal voltage operated to bring in play the voltage of the battery which created the potential on the anode of the detector.

According to the specifications, each arrangement had advantages and disadvantages. The diode detector used in the first furnished no amplification but it dispensed with the necessity of an additional battery or source of current supply. The second not

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only required an additional battery but an adjustment between the voltage delivered by the two batteries which cooperate to vary the negative potential on the anode of the triode detector.

Both arrangements include devices to prevent the passage from the detector to the audio tubes, and from the detector to the grid of the amplifier tubes, of undesired forms of electrical energy and both embrace means to provide a time constant with respect to the transmission of negative potential from the anode of the detector to the grid of the amplifier. None of these are now asserted to be novel or to constitute a part of the asserted invention.

In Wheeler's drawings and specifications he exhibited both methods and said of them that they operate "substantially in the same manner", and again that they are "substantially similar in operation." In his application he presented claims which did not specify the kind of detector to be used, and others calling for a diode. All of the latter were disallowed and he concurred in their cancellation without prejudice. He had asserted in prosecuting his application that "the invention can obviously be used with any kind of detector." Nine claims were finally allowed. Just before the patent issued, and nearly five years after original application, Wheeler presented a number of additional claims. In two he described the detector as a diode and in one of these he denominated the resistance connected between the detector anode and the amplifier cathode as a "high resistance." He asserted that these two claims were "practically the same as allowed Claim 11", which became Claim 1 of the patent as issued and specified no particular form of detector tube and no high resistance. They were allowed as Claims 10 and 11 of the patent as issued.

In the *Abrams* suit only Claims 1, 5, 6 and 10 were in issue. The contention was that the invention was a broad one covering the principle of automatic volume control by means of any form of circuit. The defendant insisted that the patent involved no invention in view of the prior art and cited patents issued before Wheeler's date of conception⁴ and others issued before the patent in suit on applications antedating his date of invention and pending when his application was filed.⁵

⁴ Wheeler's date of conception of his invention, according to his testimony was December 17, 1925.

⁵ Affel, 1,574,780, March 2, 1926; Heising, 1,687,245, October 9, 1928; Bjornson, 1,666,676, April 17, 1928, and Schelleng, 1,836,556, December 15,

Some of these were for transmission systems and some for receiving systems. Several disclosed automatic amplification control. All constituted prior art.⁶ Hazeltine attempted to distinguish them from the Wheeler patent in three respects. It contended that Wheeler's patent was limited to the receiving art and that prior inventions addressed to automatic amplification control in transmission did not constitute anticipation. The District Court answered that Wheeler's patent was not limited but was for any modulated wave carrier signalling system. Hazeltine also insisted that some of the prior art dealt with amplification control in amplifiers beyond the detector rather than in those through which the controlled current passed before it reached the detector, as in Wheeler. The District Court was unable to find any such distinction from the prior art in the Wheeler claims. Finally Hazeltine urged that the time constant device was not found in the prior art cited. The District Court held that if any of these alleged differences constituted invention on Wheeler's part the claims did not disclose them, and that to sustain Hazeltine's contention would be to rewrite the claims.

The Circuit Court of Appeals took a more liberal view of the Wheeler patent as evidenced by the claims in connection with the specifications. It assumed, for the purposes of decision, that Wheeler's patent was limited to receivers. It recognized the difference between the feed of the negative potential back to the radio frequency amplifiers instead of forward but it found no invention in the change. It held there was no invention in the provision of a time constant. That court, therefore, found that all Wheeler did was to take certain obvious steps in an already crowded art, which steps were based upon various disclosures of that art, and that the changes he made did not amount to invention. Both the District Court and the Circuit Court of Appeals found that the mention of a diode detector in Claim 10 represented no new inventive element since at least one of the patents in the prior art,—that of Heising,—disclosed the use of such a tube in an automatic amplification control system.

1931. Fris, 1,675,848, July 3, 1928, and Evans, 1,736,352, November 26, 1929, were also cited but not discussed in the opinion. It was stipulated that the disclosures and claims of these patents did not differ materially from those embodied in the applications therefor.

⁶ Alexander Milburn Co. v. Davis-Bourneville Co., 270 U. S. 390.

Confronted with these holdings Hazeltine, as has been stated, rewrote the specifications and claims in its application for reissue. It eliminated all reference to the use of a triode detector in its drawings and specifications and limited them to a system employing a diode. Certain of the claims of the old patent, however, were retained which make no distinction between a diode and a triode since they refer merely to a detector. Hazeltine also altered the specifications to refer particularly to a diode and a high resistance. Such a high resistance had been claimed as part of the invention in Claim 11 of the original patent, which claim was not in suit in the *Abrams* case. This fact is significant for, if the high resistance had been considered novel or essential to the invention, it is hard to see why suit was not founded on Claim 11, the only claim which disclosed it.

It is evident that Hazeltine found it necessary to abandon its broad claims to a monopoly of automatic volume control circuits and to limit the claims to an alleged improvement in such circuits. The petitioner insists that the effort is unavailing for the reason that the patent, as defined in the reissue, fails to disclose invention in view of the prior art.

As is admitted, automatic amplification control was old in the art when Wheeler made his alleged invention. The invention must then consist in the conception of improved means for obtaining such control. The courts below have found invention in the combination in a radio receiver of a diode detector with a high resistance connected between the anode of the detector and the cathode of the amplifying tube and a direct connection between the anode and the grid of the amplifier for impressing negative potential upon the latter, thus obtaining from the signal voltage a so-called linear response to the variations in the amplitude of the signal current. This combination, they held, was such an advance in the art as to constitute invention. We think the decision below conflicts with that in the *Abrams* case and fails to give due weight to the disclosures of the prior art.

The Circuit Court of Appeals distinguishes from Wheeler's conception automatic amplification control used in receivers, such control used in transmitters, such control used for other purposes than volume control of audio waves, or accomplished by the use of a triode or by means other than those which employ the signal

current itself and also sets apart amplification control which does not produce a linear response.

There can be no question that the patents cited as prior art disclose the accomplishment of linear response. The curve exhibited in Wheeler's drawings to illustrate the result of the use of his system is duplicated in similar curves by Affel and Friis. It cannot be claimed, therefore, that Wheeler has accomplished a new result. At most he can have obtained an old result by new means.

The prior art discloses that automatic amplification control is useful both in receiving and transmitting devices for the accomplishment of various ends, including volume control. We agree with the Circuit Court of Appeals for the Second Circuit that the limitation of Wheeler's claims to receivers of radio signals would not spell invention.

The respondent insists, and the courts below held, that the reissue patent is limited to claiming a diode detector and a high resistance connected between the detector anode and the amplifier cathode and a direct connection of anode with cathode. Passing the fact that Claims 2, 3, and 6 in suit embrace any sort of detector without limitation, and assuming that the reissue is limited as suggested, it remains that practically all of the patents cited from the prior art employ a resistance to impress the required potential on the amplifier grid for controlling amplification and that two of them, those of Heising and Slepian, disclose the use of a resistance in connection with a diode.

The court below distinguishes Heising on the ground that his purpose was not to control the volume of audio waves but rather to use less current in the radio frequency amplifiers of a transmitter. We hold, as did the Circuit Court of Appeals of the Second Circuit, that these distinctions do not negative anticipation by Heising. With respect to Slepian, the court below remarks that his device was intended to accomplish a different end. This is true for his object was to provide a receiving system which would admit of an extremely high amplification of received signal impulses. But the use of automatic amplification control, whatever the end in view, is the critical consideration.

The court below states that neither Heising nor Slepian succeeded in producing automatic amplification control. In this the court overlooked the uncontradicted testimony of the respond-

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ent's expert, Dr. Hazeltine, who flatly testified that each of them does produce it. And Heising produces it from the signal current by the use of a diode detector, a "high resistance" inserted between the anode thereof and the cathode of the amplifier and a direct current connection from the detector anode to the amplifier cathode.

We think the court below was in error in stating that all the workers in the prior art obtained their control potential from an additional battery whereas Wheeler obtained it from signal energy. This is not true of Heising or Slepian.

Nor can Wheeler claim novelty, as the court held, in the production of a linear response. While Friis obtained energy for the production of potential from a battery, he discloses a resulting linear response comparable to that claimed by Wheeler. If, as is now asserted, the insertion of a high resistance between the anode of the detector and the cathode of the amplifier is an integral part of Wheeler's conception, it may be noted that a resistance to develop a potential to be carried to the amplifier grid is disclosed by prior inventors, including Heising, Friis, Slepian, Affel and Evans and several of them describe it as Wheeler does, namely, a "high resistance".

We conclude that Wheeler accomplished an old result by a combination of means which, singly or in similar combination, were disclosed by the prior art and that, notwithstanding the fact he was ignorant of the pending applications which antedated his claimed date of invention and eventuated into patents, he was not in fact the first inventor, since his advance over the prior art, if any, required only the exercise of the skill of the art.

The judgment is reversed and the cause is remanded for further proceedings in conformity with this opinion.

A true copy.

Test:

Clerk, Supreme Court, U. S.